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The Darkness of the Coal-Mine a Neglected but Ever-Acting Cause of Explosions.

IT is with a feeling of profound sadness that we take up the pen to comment on such words as "Fearful colliery explosion! Loss of sixty lives!" Is it of any use, it may be said, to write on so painful a subject? Has not all been said that can be said? all done that can be done? Is there not the working of an inexorable law of nature concerned? Is there not a definite amount of risk incurred in piercing the bowels of the earth, which, by mathematical law, will find an expression in a definite number of human lives sacrificed per million tons of coal? It is now some sixty years since two eminent men,—one gifted with the genius of the laboratory, the other with that of the mine, and of something more,—set themselves to the task of preventing explosions in mines. Yet there can be no doubt more human lives are now annually lost by explosions than was the case when Humphrey Davy invented the Davy lamp, and George Stephenson invented the "Geordie."

We confess that for some four-and-twenty hours this feeling of despondency prevailed. Little wonder that such should be the case. To the quiet reader of the morning's paper, in London or in the country, the unexpected appearance of those formidable capitals in the columns devoted to telegraphic intelligence gives a shock of no small violence. What it must be in the Black Country, language fails to tell. A heavy rumbling, like that of distant artillery, is heard. The sound is followed by a quivering of the ground, and a violent shaking of the houses. Phenomena of this kind are not unusual in many parts of Southern Europe. They are signals of terror. The whole population of an Italian or Greek town rush out into the streets. The saints are invoked with a fervour to which the worship of Northern nations can show little resemblance. The feeling is, indeed, one of terror; but it is not one of hopeless terror. The next shock may prove more fatal; but this shock has passed by. There is, indeed, the dreaded *replica*; but this follows so rapidly on the first shock of the earthquake that the danger is over, and the worst known, almost as soon as the alarm is given.

It is otherwise when such a shock is experienced in the Black Country. Those who feel it have not the wholesome counter-irritant of fear for their own safety. Their alarm has not the safety-valve of instant action. They have not the satisfaction of feeling that, at least for the moment, they and theirs are safe. The terror is less intense, may be, at first, but an echo to the shock is given by a sharp pain in the region of the heart. The terror is not for self, but for others; for the husband, the son, the breadwinner of the family. And as to that loved object, the terror is as profound as it is instant. Few can tell what it is to be a wife or a mother, or even a child, in the Black Country, when an explosion occurs, and announces itself by something as rapid as the telegraph. From all directions there is a rush to the mouth of the pit indicated by the sound. And when, as at twenty minutes to eleven p.m. on the 13th of January, the mouth of the shaft is unapproachable from the volume of sulphurous smoke which pours forth, all is told in a moment.

So long ago as December, 1850, the question of explosions in coal-mines, and the ventilation of collieries, formed the subject of discussions at the Institution of Civil Engineers. A paper on the former subject was presented by Mr. W. West, and one on the latter by Mr. W. P. Struvé. Eminent men, now no more,—Mr. Frank Forster, Dr. Arnott, Mr. Goldsworthy Gurney, —took part in the discussion. The danger of naked lights, not only in themselves, but also as rendering a brisk ventilation in the workings impossible, was pointed out. "I have many times seen," said one gentleman, "colliers with the safety-lamp burning, and they working with a naked candle also, burning close to one another." "Men have been known to dash in pieces Upton and Roberts's safety-lamp, on account of the weight." The story is familiar to many of Faraday jumping from the seat on which he was sitting, during his examination of the Haswell mine, on being told, in reply to his question, "Where is your powder?" "Why, you are sitting on it!" In this Haswell mine case, the accumulation of gas in the goaf, which extended over thirteen acres, was indicated as the cause of explosion. The practice of blasting, in many cases, has proved fatal, and has been checked by legislative enactment to a certain extent. That the Davy lamp is not, what Davy acknowledged that it was not, a perfect means of safety, in all situations and under all circumstances, was urged and acknowledged. In the case of a fall of roof, for example, a Davy might be crushed, and might explode gas at the moment. This is said to have occurred, but proof is difficult. Twenty years later than the discussion we are quoting, the same subject was again debated, by the same scientific body, on the reading of a paper "On the relative Safety of different Modes of working Coal," by Mr. George Fowler. Mr. Robert Stephenson took part in that discussion. He said that he believed there was scarcely a coal-mine in existence which could not be safely worked, with proper precautions. For three years of his life it had been his duty to go down a coal-pit at four o'clock in the morning, and to visit every working in the mine. In those days ventilation was not so much understood as is now the case; nor was the barometer properly watched, although the indications given by that instrument are of the highest value to the miner. The old-fashioned way was, when gas was met with in the working stalls, to put up a board with the word "Jackets" written upon it, to intimate that the place was unsafe; and if only a small quantity of gas was present, the men drove it out with their jackets. When this is within the experience of an engineer of our own time, it is clear not only what great advance has been made in the practice of ventilation, but against how powerful an influence of careless habit the reformers of our coal working have had to contend.

Mr. Stephenson candidly admitted that, though he had nothing to gain either way in the matter, it was possible that he might have a prejudice in favour of the "Geordie," the safety-lamp invented by his father, George Stephenson. He certainly preferred it to the "Davy." He had had a Davy lamp "fire" in his hand as often as he held it up to the roof of the working, and by constant repetition of that action the wires would have got red hot, and would even have burst. The "Geordie" has a glass tube inside, and with this lamp, when exploded by the passage of fire-damp through the screen, the flame is always extinguished, so that the lamp has to be relighted. Thus an additional degree of safety is obtained at the cost of a considerable inconvenience. The workman may be left in the dark in a long working, and would have to go, in the dark, to a place of safety in order to relight his lamp.

The "Davy" lamp, however, yields more light than the "Geordie." In the Belgian coal-mines, Mueseler's safety-lamp is used. In this a part of the metallic covering which surrounds the flame and forms the chimney is replaced by glass, affording more light than that yielded by the English safety-lamps. We may add that the recent discovery of the mode of annealing glass in oil ought to be so applied as to make safety-lamps partly composed of glass fully as strong as the "Davy." The air for supporting combustion is admitted above into the Mueseler lamp through two wire-gauge diaphragms at right angles to one another. Another Belgian lamp is that of Eloin, which has a concave glass at its lower part, to disperse the rays of light. Messrs. Liaute and Denoyel, students in L'École Polytechnique at Paris, have devised a lamp in which the gas necessary to support combustion is generated within the lamp itself. In an experiment made at Paris, one of these lamps was burned for three-quarters of an hour 8 ft. *under water*, and when drawn up was burning as brightly as at first. The photo-electric lamp, invented by MM. Dumas and Benoit for the use of miners, is one of those elegant applications

of scientific ingenuity which answers so perfectly in the lecture-room, but which present so many points of objection when we come to the stern rough reality of underground life. The generating cells and helix are enclosed in a case which is strapped on to the miner's back like a knapsack. The conducting wires, properly insulated, pass to an illuminating coil within a glass cylinder, provided with a metallic cap. The incandescence of the coil supplies the light, while the access of air, and of fire-damp, is prevented by the hermetic closing of the case. Those who can remember George Stephenson will be able to imagine the mode in which the practised miner would have looked at this beautiful scientific toy.

With regard to the application of the electric light to coal-mines, nothing has yet transpired to lead to the conviction that any positive advantage, as far as absolute safety is concerned, is thus to be gained. A splendid light at the bottom of the shaft would, no doubt, be a great boon to the men there engaged. But the proportion of the work thus aided would be very small, and that, moreover, would be carried on at the point least liable to the occurrence of explosion. A little study of the plan of a coal-mine will convince any one of the great difficulty which would attend the application of any system of illumination that depends on concentration of light. "A colliery air-channel, says Mr. Struvé in the paper before cited, "may be compared to a gas-main in a street, with numerous perforations, through which the gas is supplied to the various adjoining lamps." In the Eagleback colliery, for example, the air descends a sloping drift 700 yards long, with a sectional area of 50 square feet; it then proceeds along to a level heading of 600 yards in length, and 36 square feet area; and thence into an air-channel of 350 yards long, and 16 square feet area, which reaches the extreme end of the colliery. Thence it courses through all the stalls, passing from one to another, through channels of about 16 square feet area, for a distance of about 400 yards; then through an air-channel of 1,200 yards long, and 12 feet sectional area, which is surrounded by an extensive goaf. Finally it ascends an up-cast shaft of 9 ft. in diameter. There are thus 3,270 yards of air-channel, varying in area from 50 to 9 square feet, through which 225 ft. of air per second are driven at velocities varying from 4½ to 25 ft. per second. The illumination of such a series of galleries, from a few luminous points, would seem to be out of the question.

Again, as far as absolute safety is concerned, it is easy to err. Of the three modes in which illumination is now produced by electricity, that of incandescence, which is the method adopted by Mr. Edison, is clearly out of court as to safety. An incandescent coil or plate of metal, unless hermetically enclosed, would fire fire-damp more suddenly than a naked flame. This method is, in fact, familiarly known and used for blasting. As to the voltaic arc itself, we speak with more hesitation; but we apprehend that the result of its contact with firedamp would be the same as in the case of incandescent metal. There remains the expedient of the use of the "Geissler tubes"; but M. Fontaine states that the feeble lighting-power of these tubes renders them unsuited to domestic and industrial usage. Thus, if the difficulty of producing, by means of dynamo-electric machinery, a large series of small illuminating *foci* were overcome,—a step which has as yet to be taken,—there is every reason to fear that each of these *foci* would prove a source of greater danger than a safety-lamp, or even than a naked light. As to the idea of sending forward a supply of light reflected by a series of mirrors from a powerful *focus*, we have to remember that, irrespective of the irregularity of the channels and workings, light suffers a notable diminution with every reflection, and in its direct journey loses its illuminative power in the ratio of the square of the distance traversed. And if the plan of a mine, whether worked as the "long wall" is, or any modification of the "pillar and stall" principle, be regarded, it will be at once seen that every working miner must carry his own light. Certainly, with all the inconvenience of its straps and wires, the photo-electric lamp of Dumas and Benoit promises more practical aid to the coal-miner than any of the more recent and more ambitious modes of electric illumination.

A coal-mine, in fact, is the very citadel of naked human labour, in every sense of the term. In no place are the wise recommendations of practical science more stoutly resisted. In no place can purely theoretic science, or imaginary and untried improvements, have so little chance of being introduced. Nowhere is the speculative reformer more certain to break his head against some coarse, angular, irreducible fact. Some time ago, as our readers were aware, a number of well-meaning gentlemen endeavoured to avert a panic price for coal, by arguing that if we only went deep enough our resources would be inexhaustible. It never struck them to inquire how much cheaper coal could be delivered in Newcastle from Belgium, or other districts, where the upper seams were not exhausted, than it would be if extracted from depths where the temperature of the earth rises considerably above blood heat. An amusing instance of the mode in which ugly facts are left out of sight in discussion will be found in a paper on "Coal-mining in Deep Workings," which followed that on the safety of different modes of working, to which we before referred. The author wished to show that coal could be raised from the enormous depth of 7,000 ft. He could not arrive at a lower temperature for this depth than 176° Fahrenheit, which alone might have been thought conclusive. But he argued that heat is transmitted from one body to another in three different ways,—by radiation, by conduction, and by convection or contact with cooler air. The decrease of the temperature of the passages in mines by artificial ventilation, down to a degree at which men could breathe and work, be regarded as quite manageable, on the ground that the conduction of heat to the exposed surface of the coal or rock, which would be constantly going on, would have a constantly diminishing effect, as the heat would be taken from the face by convection more rapidly than it arrived there by conduction, and that thus the temperature of the air in the workings would be kept down to a mean of 91° 9′ Fahrenheit at the depth of 7,000 ft. It is unnecessary to go through the pages of calculations which result in this comfortable assurance, for the reason that they omit altogether the consideration that the miner has to stand, or even to lie on the ground. Instead of being surrounded (as his mouth and lungs are supposed to be) by a constant stream of cool air, at a given distance from a face which has been cooling for forty days, the feet or naked limbs of the man would be in close contact with the fresh-cut and uncooled surface of the floor of the mine. How much work would be done under that indispensable condition, with an earth temperature of 176° Fahrenheit we leave to our readers to determine. Mr. Robert Stephenson quietly remarked on the paper that in his own collieries it had never been attempted to work at such a depth as 7,000 ft.

Are we, however, to stop here? Are we to content ourselves with a statistical view of the case—to inquire how far the average death-tax of one life for every 100,000 tons of coals, which was the ratio in 1869, has been reduced or otherwise by recent legislation? Are we to subscribe to the dictum of Mr. Stephenson, who said that his opinion as a young man, which had been borne out by subsequent experience, was that the so-called Government inspection of coal-mines was useless? "The inspector came after an explosion, and went down the pit, and then told the men what they ought to have done; but he never told them beforehand what they should do to prevent an explosion." Mr. Stephenson's own opinion was that the great step to be taken to insure safety was to increase fourfold the area of the shafts. "He repeated that, for the quantity of coal got,"—that was in 1870, since which date there has been an increase of more than 30 per cent. in that quantity—"the shafts ought to be quadrupled, either in area or in number." It would be of great interest to have such a return of numbers and area of shafts, lengths of workings, number of men employed to each shaft, and proportioned yield of coal, as should show how far the advice of one of our first engineers, himself a practical and experienced miner, has up to this time been followed.

It strikes us, however, on a review of the interesting information of which we have thus given a very brief abstract, that there is one hitherto unnoticed practical point which comes to the fore, and that with great distinctness. Out of the mining casualties in 1866-7-8, Mr. Fowler showed that explosions were the cause of 29 per cent. Falls in the mine caused a greater mortality, 34 per cent. Shaft accidents made up 12 per cent.; the remaining 25 per cent. being grouped together as miscellaneous. Of these the explosions may, as a rule, be regarded as preventible. If no blasting is allowed, and no naked lights are introduced, in a fiery mine, no explosion can, except under very exceptional circumstances, take place. Yet year after year they do take place. And the Government inspection,—and we wish Mr. Robert Stephenson were among us to admit it, as no doubt he would frankly do,—has had, at all events, some good result in discouraging the use of powder in fiery mines. Now, it is not consistent with any profound knowledge of human nature to argue that it is the inherent wickedness of the miner which induces him to take matches in his pocket, or to open his safety-lamp to trim the wick. After all is said that can be said of want of thought, rashness, pig-headedness, sacrifice of the lives of others to a moment's gratification, and so on, there remains the plain truth that some very powerful influence must be constantly acting on our vast underground population in order to induce them to run such fearful risks, and to produce explosions sweeping sixty men at a time from the world. What is this influence?—this strong instinct, which drives the miner to rush on to his own destruction? It may be said it is the craving for tobacco. But smoking is, we apprehend, prohibited in fiery mines, and it is an offence which gives immediate and unmistakable evidence of committal, while it is one against which it is possible to guard by proper precaution in searching the men.

We apprehend that the cause is to be found in the strong instinctive desire for light, which, in those regions of profound gloom and damp, is apt to become uncontrollable. Danger is a distant evil; darkness is a present and pressing one. The natural desire for light is intensified by the need of light for the workman. How many hard blows of the pick would one good ray of light save? How much wasted time, and lost labour, is unavoidable, when the source of illumination is the faint and veiled ray of the "Davy" or the "Geordie"? It is all very well for those of us with whom night, in our houses if not in our streets, is made brighter than day, to declaim against the wickedness of the miner who, groping in a Cimmerian gloom, tries to turn a little more light on a bit of work that is baffling his over-taxed strength. Here, then, may be found a cause for explosions which is deeply based on an instinct of human nature.

What follows? It follows that he will be the best friend that the miner ever had who will give him a lamp combining the two great, and hitherto unreconciled, properties, of non-explosive safety and high illuminative power. Such a lamp, moreover, should be cheap. It should be strong. It should be simple. It should be capable of adjustment of the light without opening. It should be capable of being locked, and opened only by its own key,—a key to be kept by the inspector, and never given to the miner. In fact, it should be a lamp which the miner should have no temptation to open, except for the purpose which is forbidden,—that is to say, to set something on fire,—and which he should be unable to open for that purpose. This would be the true safety-lamp. A lamp to give the light of half a dozen candles, and which would only yield its full light when properly closed. By giving such a lamp to the miner we should supply his great want, and we should put into his hand, not a constantly irritating source of temptation, but a true and invaluable friend.

Is it too much to ask the genius of the day for such a lamp as this? We reply that, in our opinion, it is not. What will be the reward of the inventor? Judging from past experience it will be this. He will be allowed to spend his fortune and to break his heart in the effort to force on mankind a beneficent invention, the adoption of which will save at least one human life per day, and prevent the annual widowing and desolation of from two to three hundred families.

Memorial Window in St. Paul's.—A stained-glass window has been erected in the north-west chapel of St. Paul's Cathedral, nearly under the west tower, to the memory of the late Dean Mansel. The subject chosen for illustration is the Incredulity of St. Thomas, as related in St. John xx. 24; and the work has been entrusted to Messrs. John Hardman & Co., under the direction of Mr. Penrose, architect to the dean and chapter.

PAINTINGS AT THE BURLINGTON HOUSE EXHIBITION.

ALTHOUGH the collection of paintings at the Academy loan exhibition this year did not at first sight seem very attractive, and contains hardly anything that is obviously striking or astonishing, a judicial survey of them at leisure reveals a great amount of work of very high interest artistically and historically.

Among portraits, Hoppner leads the way in the first room with a very dignified solidly-painted work "Lady Elizabeth Compton" (1), in a style reminding us of a more modern taste as to colour, the general effect being dark and sober, with a coral necklace giving the one slight point of colour. Lawrence's "Mrs. Horsley Palmer" (3) is inferior to this in artistic power, but is a very good specimen of the painter's peculiarly aristocratic refinement; the fine throat and neck of the sitter (her best charms), are very delicately drawn and modelled. Some small Reynolds and Gainsboroughs near these are more notable for the special manner than for the special merits of those artists; Gainsborough's "Lady Whichcote" (13), however, shows how far he could render a decidedly plain woman interesting in a picture, by pose and manner; he introduces here the particular white dog which was such a favourite with him. Reynolds's portrait of Fox, standing with his hand on some papers labelled "A Bill for the better regulating of the Affairs of the E. I. Company" (a detail introduced at his request, as connecting him with a measure "which would always be the pride of his life") has the greatest historic interest, but is hardly in other respects a favourable specimen of Reynolds; the hand laid on the table is very negligent in drawing and finish. But Romney is well represented; in his "Lady Sullivan" (9), it is true, the flow of the drapery to one side is rather too palpably managed; in the pendent picture, "Mrs. Lee Acton" (20), there is no such defect, and this is a beautiful sketch portrait,—it cannot be called a finished picture. Another portrait of the same lady (42), standing in the middle of a landscape, is more conscientiously finished, and even more impresses us with the remarkable and *spirituel* beauty of the face, though the peculiar make (probably) of the gown of that day gives an odd and awkward line to the lower part of the figure. The finest portrait in this room, however, is certainly Reynolds's "William Frederick of Gloucester" (45), as a child, but assuming the air and equipment of a man in an oddly serious and sober manner; the work is one in which, as in the "Strawberry Girl," and in another child-portrait, a little Lady Charlotte or Lady Catharine (we forget the title), Reynolds has achieved a real originality in colour, of a nature which is to be perceived rather than described: the tones of the dress, &c., are so unusual and subtle, in a kind of colourless colour, that one is tempted to think the picture has faded very much, but the glow on the countenances shows that this is not the case. This work is balanced by Gainsborough's "Pink Boy" (39), a work far behind the "Blue Boy" in character and force of colour. Sir Joshua's "Kitty Reynolds" (48) is a lovely thing in pose and drawing, and pleasing in colour,—more pleasing probably to many than such a brilliant experiment as that just mentioned, which is *caviare* to the general; but, on the other hand, this warmly-coloured portrait exhibits the ordinary resources of colour, rather than its refinements. The three Hogarth portraits which hang next each other (32, 33, 36) are all fine unpretentious works, but curiously illustrate what we have often fancied in Hogarth's portraits, a tendency to give to his sitters the same kind of upward tilt of the countenance, expressing alertness combined with a certain dash of something like conceit, which we see in his own well-known portrait of himself. In these three paintings placed together the resemblance in pose is too marked to be overlooked. Harlow's portrait of Northcote (30) is a brilliant study of a very shrewd and characteristic countenance: it is the property, we see, of Mr. Frith. Zoffany's portraits, including a large "Family Piece" (27) are dry and uninteresting, though the large group referred to is combined in an effective and natural manner. Among the landscapes in this room are two or three charming little Nasmyths, two fine Van der Veldes, a Richard Wilson, a Tivoli (not *the* Tivoli), very dull in colour, and a charming work by Collins, "Sunrise on the Coast" (40), beautifully composed without apparent study, full of an indefinable sea-coast feeling, and the sparkle of the water under the first glint of the rising sun is beautifully given, as well as the movement of the waves breaking on the beach.

In the second room the main attraction is undoubtedly the corner where are collected the works by the great masters of the realistic Dutch school, in the position which has usually been assigned to their works in the annual loan exhibitions. These are not numerous, but they are remarkable in quality. Jan Steen's large work with many figures, called "Dutch Festival" (99), which attracts attention most, is not, however, one of the finest, and seems to us to have been "cleaned" or painted on in more recent days, at least the central figure of the mother has that appearance. It is not, in fact, a "festival," but simply a scene at an inn, where the various characters and their occupations are effectively contrasted; the key to the feeling of the whole is in the central figure just mentioned of the woman suckling her child, regardless (as far as possible) of the medley of confusion going on around her, the noise of the boy beating his drum close to the child's ear, and of the revellers at a table on the left, one of whom stands up to drain a large "flute-glass": an old hag who is bringing in refreshments and whose figure composes with the centre group is very important in its effect on the whole arrangement. This is a striking work, no doubt, but it is not equal in sentiment to the smaller Jan Steen (54) on the other side of the doorway, representing a small family saying grace over their meal. In this, which seems much more as Jan Steen left it than the other,— much richer in texture and less hard,—there is a simple, almost awkward, pathos in the figure and action of the man "saying grace," his head partly shaded by his large-brimmed hat, which comes home to one in a very real manner, from which the careful but always subordinated treatment of the accessories detracts in no way; we may admire the painting of the earthenware jug (a kind of Doulton ware of the period) and the piece of meat on the dish as much as we please; but for all this admirable execution, the personages remain the chief attractions. Even finer in the higher qualities of genius, though less interesting in subject, is a small Teniers, "Interior of an Alehouse" (104), merely a group of three figures; one lad holding a mug of beer, but turning round to make a remark to the companion who stands by him, is remarkable for the life and vivacity of attitude and countenance. Ostade's picture, with two half-drunken figures at a window and others dimly seen behind them (112), is another masterpiece of its kind; and it is really instructive in a way to compare these with such a work as the "Man in his Study," by Gerard Dow (113), a small picture, brilliant to the highest degree in colour and painting of detail, and perfectly pleasing in subject, morally speaking,—a respectable, refined old gentleman over his books, and to notice how, nevertheless, it is quite weak in its impression upon us in comparison with the two last-named works. One realises that (within certain limitations) it hardly matters what are the mere facts of the subject chosen by a great artist, if the genius is there which can breathe force and meaning into it. These works of Teniers and Ostade exhibit literally the *creative* force of genius; the power to take the common clay of humanity and breathe into it the breath of artistic life. In the same remarkable corner of this room may be noticed Metsu's "Scene at an Inn" (110), and Ostade's "The Lawyer" (107), the latter a brilliant and beautiful little work. In another corner of the same room there are three or four interesting examples of the Dutch artistic mind applied to the translation of architecture into painting; two interiors of churches by Emanuel de Witte (88, 89), a street view, by Jan Van der Heyde (92), the well-known master of painting brickwork, and a "View in Amsterdam" (87), by Gerrit Berck-Heyde, a little overloaded with shadow on the right, but the group of buildings in middle distance, seen across a piece of canal, could not be excelled for truthfulness, delicacy, and minuteness of execution. Among the other main points of interest in Gallery II. are an exceptionally beautiful specimen of Grerze (85), a head of a young girl with beautiful, almost luminous light-brown, or "golden" hair, falling in masses round her face, a face pleasantly exceptional among those of Greuze by the entire absence of the coquetry (or something even more objectionable) which characterises so many of his heads of this type; it is a sweet innocent face, with the eyes turned up inquiringly,—

"As life were one long and sweet surprise."

There is an exceedingly fine Canaletto, "The Church of San Salute" (61), remarkable for its combination of clear hard texture with atmospheric effect; and a fruit piece by Cornelius de Heem, very rich in colour, and also noteworthy for its minutely careful and correct drawing,—not always a characteristic of fruit pictures. Janssens's portraits, solid and forcible, though not reaching the best in portrait art, are worth attention; and there is a capital specimen of Frank Hals, a portrait showing something of the peculiar force and freedom of Velasquez in face-painting.

Passing over for the present the large central gallery, we are attracted into Gallery IV., where, as usual, the works of the earlier period of Italian art are bestowed. As in the other rooms, the attraction of the show grows upon one after seeming a little disappointing at first sight. The two most prominently important works are two large and very fine Gian Bellinis, the property of Mr. W. Graham (199, 203). These are works of the most noble quality in design and feeling, despite a little of the stiffness of the præ-Titian period in Venetian art; in No. 199 the two angels standing one on each side of the group are especially remarkable for combined grace and power. The colour has stood wonderfully, nor do the pictures appear to have been painted on or "cleaned," in an objectionable sense of the word. The rich harmony of these works and their admirable preservation show what a start Titian got from his predecessors in Venetian renown in these matters, and how much he must have really owed them in spite of their want of graciousness towards the young rival who was to eclipse them. A remarkable work hung between them is the portrait of a woman, attributed to Piero della Francesca, a half-length profile in a stiff semi-decorative fashion, but of the most beautiful and delicate combination of colour: it is curious that the face is relieved against an almost flesh-toned ground, not differing very much from the general tone of the face, it is partly to this that the peculiarly delicate effect of the whole is to be traced; the tones of the dress are retiring and beautifully harmonised, and the whole is accentuated by a coral necklace, which is the one bit of positive colour. The treatment of the hair is remarkable in its freedom and realism, if really by Francesca or an artist of his date. Another exceedingly unusual work is Sir Henry Hawley's large picture, of which the author is not known, and it is labelled only "Venetian School"; this represents the flight into Egypt (206), and whatever doubt there may be as to the artist, there can be none that he was familiar with the work of Giorgione, and owed a great deal to him, though he had not learned to acquire "a temperance that would beget smoothness," or quietness, in the action, which is too bustling, but, at the same time, full of life: the whole group, preceded by a very lively angel showing the way, are full of hurry, except the Virgin sitting on the ass; she is playfully caressing the infant, who puts up his hand to her face. The colouring is exceedingly Giorgionesque, so is the whole style and attitude of the man on the further side of the ass, turning away from the spectator; though it would be impossible to put down the work as a whole to Giorgione. Another fine contribution is the "Virgin and Child, and St. John," by Ghirlandaio (197), in which the artist's mode of modelling the shadows in the flesh by minute hatchings in warm colour (nearly red) may be studied to perfection: the infant, who in this painting stretches out his hand to take some fruit from the hand of an angel, at the same time looking, not at the gift, but up in the face of the giver, has that majestic expression which so many of the painters of Italy studied (apparently) to infuse into the countenance of the holy child in their paintings. Mr. Hooker's "Madonna and Child," by Raffaelle (193), strikes with some surprise in regard to its alleged authorship, which, however, seems perfectly well established. It has the Raffaelle spirituality, but not the Raffaelle ease and elegance of pose and drawing, and has a gold background. An inscription on the back states (we are told in the catalogue) that the picture was bought by Elizabeth of Gubbio, who was superior of the Convent of S. Chiara, at Urbino, in Raffaelle's lifetime. We should be tempted to think that the painter had adopted a religious style with the view of suiting the

feelings of some special purchaser, or else that it was a youthful work before he had quitted the track of his predecessors. Next to this an archaic Byzantine triptych (192) of the Crucifixion strikes us by its fine composition and intensity of dramatic expression, in spite of archaic drawing: the group of women all drawn together in one corner, with a unanimous expression of shrinking and terror, and on the other side the group of soldiers and other excited spectators, and hands thrust up into the air in a manner almost reminding us of Titian's "Assumption." To see these dramatic qualities of art in a small painting of so naïve a style of execution is very interesting. A diptych by Taddeo Gaddi is another very interesting and, in its peculiar way, expressive work, though it has nothing of the vigour of action of the little Byzantine picture last named; a certain angel's head in profile is beautiful in execution, and a calm saintliness of expression: much of the soul of Gaddi, one would think, went into that face. There are some very curious decorative studies or illuminations of the school of Giotto, and, indeed, apparently by a very close follower and admirer of the master; also a beautifully-finished decorative picture, as we should now consider it (but not so intended by the painter) by Fra Angelico, of "The Annunciation" (880), in which decorators may take note of the angel's wing as furnishing a hint for a rich effect. Among some of the rather heterogeneous works on the other side of the room is a portrait of Mary Queen of Scots by Pombus,—a hard performance, not giving the idea of much personal beauty: it is hung rather significantly over a little Queen Mary by Holbein, and the family likeness in the two portraits is distinctly traceable. A fine specimen of Quentin Matsys (219) represents two countenances as mean and repelling as could well be (the old man would do for Harpagon), but the expression of odious human character is in this case powerfully given without being weakened by fantastic accessories.

We may have further remarks to make as to the other pictures, and the miniature col ection.

A SMOKELESS LONDON.

THESE words are being written on a cold frosty morning: the opening of one of those days that will make the winter of 1878-79 memorable in our country's annals. The price of coal has been gradually rising for several weeks. This has followed upon an increased demand; and the demand, of course, has its origin in the lowered temperature and the craving of human beings for heat. At such a period the consumption of fuel may be looked upon as having reached its annual maximum in the metropolis. The coal bill becomes a serious item in the households of the poor in such weather as this, and every exertion is necessary to provide enough to wage a successful battle with the frost. Such being the state of affairs in every establishment that owns a chimney and a hearth, the result upon the condition of the London atmosphere can easily be predicted. Upon looking out of the window,—instead of the clear, exhilarating prospect of fresh air, which, in the country, must be exceptionally bracing and clear,—the Londoner is frequently confronted by a dense, yellow fog, through which he sees the smoke of a hundred chimneys, each pouring its contribution of carbon and sulphurous acid and carbonic oxide into the already overloaded atmosphere. For such weather, every person, except perhaps the coal-merchant and the coal-master, wishes coal to be as cheap as possible. So far from any one grudging the use of coal at such a time, kind-hearted people are trying to make up the deficiency and distributing fuel to those who cannot afford to buy it. The question naturally arises in an inquiring mind, is all this atmospheric pollution a necessary condition of warmth? Unthinking persons look upon smoke, especially in large manufacturing towns, as a condition of prosperity. They know that in dull times, when the cotton factory is closed, there is no smoke to be seen coming from its chimney; it ceases along with the roar of the machinery and the employment of hundreds of workpeople. No doubt, the smoke is a sign of prosperity, but is it a necessary condition of prosperity? In prosperous times, might the machinery not spin cotton or weave cloth just as well, and employ just as many hands, if there were no smoke coming from the factory chimney all by reason of its having all been consumed? The answer that science gives to this question is, that not only could the work of prosperous times be conducted quite as well without an escape of smoke, that renders life in a large manufacturing town very much less tolerable than it otherwise would be, but that if the smoke were consumed it would just be so much money in the pocket of the manufacturer, and so much material wealth saved to the nation at large.

Every one is tolerably well acquainted with the conditions upon which the combustion of a piece of coal depends. When heat is applied to it, gas escapes, carrying with it particles of carbon that have been stored up in the recesses of the coal-mine ever since the time of the primeval forest of which it is composed. As soon as the gas mixes with the air at the high temperature of a furnace, or even of a domestic fire-place, it combines with the oxygen of the atmosphere, and the result is flame or combustion. Before combustion is possible, a certain proportion of oxygen must be mixed with the gas, and if this is not present the gas escapes up the chimney unconsumed. With regard to the particles of carbon, which form the visible condition of smoke, a somewhat higher temperature is necessary before they combine with the oxygen, and if there is not enough oxygen for the combustion of the gas, there will be still less available for burning the smoke, and it will pass up the chimney without having ever, as it were, had the chance of being converted into heat at all. These facts have been known to men of science for a great many years, and various attempts have been made to apply them in such a way as to lead to a solution of the difficult problem of complete combustion. In the great industry of iron-smelting, which not long since was distinguished for its extravagant waste of fuel, the solution of this intricate difficulty has been completely solved among the more intelligent men who avail themselves of the opportunities which science has placed within their reach. Until within the last fifteen or twenty years there was no more wasteful appliance in the whole field of British industry than a blast furnace. The materials from which pig-iron (that is, iron ready to be cast into grates and railings, or converted into malleable iron by being puddled) was made were thrown into a great furnace with an open top, from which the flames escaped, and still escape in some places, in such a manner as almost to turn night into day. Now all this waste gas, instead of being allowed to escape from the top of the furnace, mixing with the oxygen of the air and being converted into flames, the heat of which is entirely lost, is conveyed away in pipes and made use of to drive steam-engines and heat stoves,—in fact, is employed to do everything outside the blast-furnace itself, which formerly was done by the use of immense quantities of coal. When any thoughtful person begins to consider the number of interests that are served by such improvements, it is quite clear that they are by no means confined to the ironmaster. The population which was formerly inflicted with the atmospheric pollution which came from the mouths of the open furnaces have had this sort of nuisance permanently put an end to. Every one knows that the position which this country has attained to in its manufacturing pre-eminence, and which it requires so great a struggle to maintain, is dependent upon the material wealth which it possesses in its coal-fields, so that the nation as well as the ironmaster is deeply interested in the saving which has followed upon a more scientific use of coal in our blast furnaces. A third and very important interest which, unfortunately, for the future of this country, is very little thought about, must be a gainer by such methods of economising fuel, viz., the interest of the generations who are to follow us, and who will be dependent upon the supplies of fuel which we are now wasting so extravagantly. Upon thinking over the matter a little further, it becomes quite clear that these interests are the natural consequence the one of the other. That is to say, cleanliness follows upon economy, and economy upon cleanliness. So far from smoky chimneys being a necessary condition of national prosperity, they are a source of national loss, and cleanliness and a pure atmosphere are a source of material saving. Science is really not by any means to blame for having made the world dirty; because, when she is appealed to, she is not only able to make it clean, but in doing so she effects a great saving of the national resources. This being so, it will be well to turn to the factory chimney, and see what can be done there to bring about the economy that has been effected in the blast-furnace. In one important respect the boiler furnace of the cotton-mill is at a great disadvantage as compared with the blast-furnace, because, in the nature of things, it has a much lower temperature. In the blast-furnace, every device is resorted to in order to maintain the temperature at a height which will smelt the iron ore as rapidly and efficiently as possible. This brings about a state of matters with regard to the fuel which renders smoke—that is, particles of carbon—almost an impossibility. All the chemical constituents of the coal are immediately converted into gas at such a high temperature that they approach the condition of permanent gases, *i.e.*, gases which, when they are cooled, will not deposit tar or any other solid matter. When gas is in this condition, and mixed with common air at the high temperature at which it comes from a blast-furnace, it is in the most favourable state to be completely consumed, the equivalent of this combustion giving out a maximum of heat. In the furnace of a boiler this desirable state of things is, of course, unattainable, because the fuel is contained in a combustion chamber, surrounded with water, the temperature of which, measured by a thermometer, is not more than one-tenth of that of the blast-furnace. Here, then, is a great practical difficulty, because, even if the boiler furnace is so arranged as to admit all the air that is theoretically necessary for the combustion of the fuel, it by no means follows that its temperature will be sufficiently great to bring about the chemical reaction between the carbon particles of the fuel and the oxygen of the atmosphere which is necessary for their combustion and the avoiding of an escape of smoke. In a well-constructed boiler-furnace, however, it is possible to arrange the firing in such a way that the addition of fresh fuel will never be made so as to give rise to an escape of carbon particles in excess of what the temperature and the air of the furnace are capable of consuming,—at least, to a considerable extent. It follows from this that care on the part of the stoker is one of the most important factors in a smokeless chimney. This has pressed itself so strongly on the minds of engineers that, knowing the frailty of human nature, and especially of stoking human nature, they have devised a mechanical stoking apparatus, which feeds the furnace at a uniform rate, and in many instances does the work exceedingly well. The proprietor of a boiler furnace is still, however, at a disadvantage, as compared with the owner of a blast-furnace in the important item of a high temperature, and the result is that he is a great offender in the matter of smoke. The question that naturally occurs to the mind of any one subjected to the nuisance of a smoky factory chimney is, What have the public got to do with this? Because a boiler-furnace is not worked at the temperature of a blast-furnace, must that be held as a sufficient reason for the manufacturer to be allowed to contaminate the atmosphere with sulphurous acid which kills our trees and affects our health? The manufacturer's reply is, of course, the old one about smoke being a necessary condition of prosperity, and that, if he is forced to do away with his smoke, he must close his gates and throw, it may be, hundreds of workpeople out of employment. The public, on the other hand, may say, very justly, "Such an argument suits your convenience, but is it true that closing your gates is your only alternative? Science appealed to in the blast-furnace gave an unequivocal reply that cleanliness and economy are allied to each other in the relationship of cause and effect. Although the temperature of your boiler-furnace is lower than that of a blast-furnace, must we necessarily take this as an answer in the face of what appears to be an axiom that dirt and waste are inseparably associated?" If obliged to give a reply the millowner might answer, "Granted that cleanliness and economy are related to each other in the way you describe, if there is such a great saving in burning my smoke, you may be quite sure that I would lessen my coal bill if I only knew how it could be done." If Science were made the referee in such a dispute, the manufacturer might reasonably urge that his business was of a practical nature, and might be ruined by the introduction of unsuccessful experiments, and that if Science is referred to it must be in the form of a positive issue as to what she really can do without the chance of failure and mishap. It is not enough that there seems to be a certainty that science

will ultimately effect a solution of the problem of complete combustion in steam-boilers, but the reply must have relation to what can actually be done. In such a case the court of appeal comes to be that of a tribunal composed of men whose knowledge represents the greatest advances that have been made in the practical application of science to the problem of combustion. If the public appeared as plaintiff, and the manufacturer as defendant before such a tribunal, it must at once be admitted that if the only fuel to be used by the manufacturer is common coal, the verdict must be in his favour in so far that he might be called upon to mitigate the nuisance arising from his smoky chimneys to a great extent, but could not be called upon to put an end to it altogether. It must not be supposed, however, that the case for the public by any means ends here.

A population suffering from an atmosphere polluted by smoke is quite entitled to ask if common coal is the only fuel which it is open to the manufacturer to make use of. If the supposed court of appeal were referred to, their answer would certainly be that common coal is not the only available fuel, and if asked by the manufacturer for an explanation, they would be bound to state that not only is common coal not the only available fuel, but that its unnecessary use is the cause of the waste and dirt complained of. The smoke which comes from a properly constructed boiler-furnace is the result of the first few minutes of contact between the fresh coal and the heat of previous charges, and it is then that gas escapes in excess of the means available for its combustion. The public then have a right to ask if this gas which is wasted, and which contaminates the atmosphere, could not be extracted before the coal is placed in the boiler furnace at all. The answer is that it can be so extracted. Again, from the manufacturer's point of view the question may be put,—"Would this process not subject me to additional expense?" The reply is,—"In the long run certainly not. The first cost of the necessary apparatus would be trifling, and would be recovered by the saving that would be effected in the short period of a few months at furthest." The manufacturer might then say,—"If you mean by this process that I should use coke instead of coal, it will certainly be more expensive, and, moreover, even if such a plan were adopted, the products of combustion, though invisible, would be more offensive and more injurious to health than those which come from the use of ordinary coal." The answer on the side of the public is,—"We do not by any means wish you to use coke. As it is only a comparatively small proportion of the gas contained in your coal which is incapable of being consumed in your boiler-furnace, it is only that small proportion which we require you to extract before adding fresh fuel. When you do add the fuel it must have been previously deprived of that proportion of its gas which renders it offensive."

If the manufacturer urged that such a proposal was impracticable or expensive, there are many illustrations to prove a case against him. Mr. Budd, of South Wales, the veteran blast-furnace economist, when first he made use of the waste gases of the smelting process, was so astonished at the result that he declared it would be a source of economy in raising steam in boilers if the coal were put into an apparatus like a blast-furnace, and nothing but the gas used as fuel. No doubt, if the gas were properly consumed, the statement was quite true if the comparison were made with the wasteful apparatus which was almost universally employed in the first quarter of the century, but even in the more advanced practice of the present day, the manufacturer stands convicted of enormous waste. Dr. Siemens, who is one of the greatest authorities upon the subject of combustion, and who has done much to introduce a more scientific application of its principles into the iron trade, stated in a lecture delivered in Glasgow about a year ago that even in the most improved description of boiler and steam-engine, only about one-ninth of the total heat-giving capacity of the coal was converted into mechanical energy or work. The steam-engine itself is only responsible for a comparatively small proportion of the waste, and it is doubtful if any great additional economy is attainable so far as it is concerned. The great source of waste is in the generation of heat in the boiler, and the larger part of that is due to the escape of gas and carbon through the chimney. Of that waste, again, the greater proportion is to be attributed to the large escape of smoke which takes place when fresh fuel is thrown upon the boiler furnace. Here, then, the manufacturer is confronted with a dissipation of that very portion of the fuel of which the public have a right to complain. This is not the place to enter into a technical explanation of the methods available for avoiding this waste, and the atmospheric pollution to which it gives rise, but in the face of the experience which has been obtained in other departments of industry in which coal is extensively employed, it is idle to say that the owners of steam-boilers have not the remedy in their own hands if they choose to make use of it. But supposing, now, that the manufacturer were forced into accepting the conclusion that not only was he an offender, but committed his offences in a manner that was both unnecessary and extravagant, there is still an argument open to him in his case with the public which, though it is not of any real weight, is a very common one. It is that which is generally known as *tu quoque*. "Why," the manufacturer may say, "should I be called upon to exert myself to get rid of a nuisance to which every hearth-fire in the kingdom is a contributory as well as myself?" It is this position which has probably done more than anything else to retard sanitary reform in the direction of atmospheric pollution. The manufacturer puts himself in the place of the plaintiff, and retorts upon him with his own arguments. The question is, can the same rule not be made to apply to the domestic consumer through the local authorities that it is proposed the manufacturers should apply to himself? If the boiler-furnace, which has so many advantages in its size and construction, is incapable of completely consuming the fuel employed, it is quite certain that an ordinary fireplace will be at a still greater disadvantage. There is no doubt that in large industrial centres the manufacturer contributes a much larger proportion of smoke than all the rest of the community put together, but even then the argument is still open to him that he is only a contributory. The consequence has been hitherto that the Legislature has only interfered with him to the extent of insisting that he shall abate the nuisance, and black smoke escaping longer than a specified time is the only offence which is subjected to a penalty. To confine the argument to the domestic consumer, and taking those districts of London in which the atmospheric pollution from smoke has its origin in domestic sources alone, the recent experience of Londoners during the fogs of the present winter has been sufficiently trying, and it becomes important then, both from a social and economic point of view, to inquire into the practicability of any scheme that has for its object the entire abolition of the nuisance complained of. In order to remove the *locus standi* of the manufacturer who argues that the public are equal offenders with himself, it will be well to see if the remedy which it is proposed to apply to the boiler furnace is not equally applicable to the case of domestic consumption. In both cases the principal escape of smoke takes place upon the addition of fresh fuel. As it is proposed that the manufacturer should be obliged to extract this quantity of gas from his coal before burning it in his furnace, and as it is quite certain that doing so would not only avoid nuisance, but prove a source of economy, is there any reason to suppose that, if the coal consumed in London were subjected to the same process, there would be anything but a great gain to the inhabitants of London, both in comfort and in pocket? Turning to the Report of the Registrar of the London Coal Market for 1878, it will be found that nearly 9,000,000 tons of coal were brought into London during the year, of which 6,639,000 tons were consumed within the London district, the balance having bren exported or otherwise disposed of. We have, therefore, to deal with a daily consumption of somewhat under 20,000 tons. If this coal were subjected to the process employed for the production of illuminating gas, it would probably yield on the average between 7,000 and 8,000 cubic feet of gas per ton. Of this quantity the offending part, that is the part which escapes unconsumed upon each addition of fresh fuel, is probably on the average not more than 3,000 cubic feet per ton. If this, then, were first removed, without materially interfering with the character of the fuel, the coal of London would be practically incapable of producing any atmospheric pollution from smoke. It is not maintained that this fuel would be absolutely smokeless, but its use would entail an amount of smoke that would be practically unnoticeable. Upon inquiring into the apparatus necessary to remove this proportion of gas from London coal, the writer does not wish to commit the reader to any details. It will convey an idea to his mind, however, of how much smaller the necessary apparatus would be than he might at first suppose, if the dimensions of an ordinary blast-furnace are taken as an illustration of the large scale upon which materials can be treated at a higher temperature than is necessary for abstracting the surplus gas from London coal. The average sectional area of an ordinary blast-furnace is about 300 square feet, and the cubic capacity about 18,000 cubic feet, and such an appliance would contain 450 tons of coal. Supposing then that the time occupied in extracting 3,000 cubic feet of gas per ton of this quantity in some such apparatus as a blast-furnace occupied two hours, then five ordinary blast-furnaces would be amply sufficient to render London a practically smokeless city if all the coal used in it were first subjected to this gas-tax. Of course no one will deny the great social advantages that would follow upon the adoption of such a system, but looking at the proposal in its economical aspects the results are still more startling. If 3,000 cubic feet of gas per ton were removed from the 20,000 tons of coal which are consumed in London daily, there would be 60,000,000 cubic feet available, partly for raising the heat necessary for the removal of the gas, but to a great extent for industrial purposes. This gas would be much richer than the ordinary coal gas sold for illumination, and might be drawn off from the coal in such a way as to make it capable of being used for a variety of purposes. If the temperature of extraction were very low, then the superfluous gas might, to a great extent, be condensed and treated so as to make all the solid hydro-carbon products commercially available. If taken off at a higher temperature it would be a much more valuable heating agent than illuminating gas, while if the temperature of extraction were raised to that of an ordinary gas-retort, what is at present being thrown into the atmosphere from every chimney in London might be used for lighting our streets and houses, or driving the engines of the electric light. There is reason to believe that with properly-constructed apparatus, 30,000,000 cubic feet of gas would be sufficient for raising the heat necessary for extracting the superfluous quantity referred to, so that there would still remain 30,000,000 cubic feet to be disposed of every day in the various manners that have been roughly suggested. If 1s. per 1,000 cubic feet were obtainable for the gas from manufacturers and others, then a daily revenue of 1,500*l*., or considerably more than half a million per annum, would accrue, and this, after making every allowance for labour and interest upon capital, would leave a large balance in hand.

Of the difficulties that must attend the introduction of such a system it would be foolish to speak lightly. No doubt there would be many, not only in connexion with the mechanical and other details which would require to be successfully carried out, but also in dealing with the various interests involved. To a certain extent the process would assimilate the values of the various kinds of coal, but they would still retain a character relative to their original quality, and if the different varieties were classed and treated separately, there is no ground to suppose that the coal-master would have anything to complain of. With regard to the practical effect upon the fuel, as it would only be robbed of that which at present passes up the chimney, there would be nothing lost to the consumer, but, on the contrary, the smoke having been removed, which often renders the adoption of apparatus well suited for warming purposes impracticable, the way would, no doubt, be opened up to a more scientific application of the principles of combustion in every-day life. Even supposing that the economic view of the question which has been taken is somewhat sanguine, though the writer cannot see how a lower estimate than 1s. per 1,000 cubic feet could be adopted, the gain to the inhabitants of London would still be enormous. The amount of labour at present expended upon the continual struggle with dirt, that results at the best in a perpetual griminess, would be reduced by one-half; our parks and squares, where the trees are becoming prematurely stag-headed, and suffering, in many cases, complete decay, would assume something like

the freshness of the country; and, above all, our lungs would be saved from the smoke that often renders a winter day in London intolerable. It is almost certain that, if the public led the way in the sanitary reform of the atmosphere, the manufacturer would very soon be forced to follow.

"ÆSTHETICS."

THE neat volume with this formidable though brief title* comes to us from France, though the English edition which is now before us forms one in a series of works brought out in this country under the title of the "Library of Contemporary Science." It may be questioned whether "æsthetics," whatever it or they may be, is a "science" in the proper sense of the word, though there is no need to quarrel with a book for its title if it tells or teaches us anything, whether in a strictly scientific manner or not. The first sentence of the introductory chapter startled us sufficiently,—"Æsthetics being, as has been said, the science of the beautiful in the arts, it would seem but natural to begin by explaining what beauty and art are respectively." *Grace à Dieu*, however, M. Veron does not in this case do what is "natural"; on the contrary, he expresses in the next sentence his conviction that *à priori* definitions are little to be trusted, and that "it is more reasonable and scientific to search among facts, to see whether they are not able of themselves to afford us the definitions we want." This is the keynote of M. Veron's work. Instead of framing theses as to what the arts should do when regarded from the point of view of abstract theory, he examines what they have done, what of that is best, and why it is best. This is at least a step towards bringing æsthetics within the definition of science, and out of the regions of cloudland; and after this declared intention on the part of the author, we turn over his pages with more hope of finding something practical to lay hold of than the title at first seemed to promise. We are removed thus from the abstract to the concrete, and prepared to accept the author's definition of æsthetics as "the science whose object is the study and elucidation of the manifestations of artistic genius." The author purposely gets rid of the word "beauty" altogether, regarding it as too vague in its meaning, and too variously understood, to be profitably employed in a work aiming at precise analysis and definite conclusions.

Let us see, as an example of the author's method and style of thought, how he applies this view of æsthetics to the consideration of architecture. He refers to the extremes to which "the symbolic school" have gone in treating of architecture, Mr. C. Blanc representing the Egyptian priests as "reproducing in an ideal form the great features of nature's architecture," Lamennais describing the Indian temples as representations of the Pantheistic idea, &c.; and against such visionary phraseology he opposes Viollet-le-Duc's simple and practical words,—"As far as the architect is concerned, architecture is the sensible and easily understood expression of a want satisfied." Applying this, for example, to temple architecture, M. Veron urges that the immense size of the temples of the East is to be explained partly by the fact that the sacerdotal societies themselves inhabited the temple, and turned it into a kind of town.

In Greece, where this was not the case, the temples merely assumed the proportions supposed to be necessary for the dwelling of the god, who was colossal certainly, but still did not require more than a house proportionately larger than those of mortals. So in speaking of the Mediæval cathedrals, he adopts the view that they were, in reality, rather federal than feudal, a kind of sacred forum, where matters of interest to the community were discussed. There may be more colour for this view than is usually supposed, but we imagine it must be taken *cum grano*; and it is certainly carrying it too far to say that the cathedral towers were built mainly for the purposes of signalling and keeping a look-out over the country. They may have been used for these purposes, but there is plenty of evidence that both west fronts and towers were matters of emulation between the monks of rival abbeys, and arose from the ambition to surpass somebody else, which has been such a constant stimulus to effort in art and science alike. But the manner of summing up what may be supposed to have been the origin of architecture,—that it "sprang from the natural aggrandisement of man's primitive dwellings," is very good and very comprehensive: and in his brief analysis of Greek and Gothic architecture, in speaking of the latter, the author fully recognises the constructive importance of the pointed arch as a means of overcoming the difficulties inherent in building with the circular arch. In the Gothic style, he observes, "everything is founded upon and referred to the pointed arch,—not by virtue of any fanciful system, but by a series of deductions from fact, which demand practical recognition quite as much as theoretical assent." M. Veron revives an interesting question further on in regard to Gothic architecture, viz., whether that honesty "in displaying construction which has been praised as such a virtue in the Mediæval builders, was really intended by them; whether, for example, they would have displayed their flying buttresses so prominently, their framework for holding up the building, if they could have avoided it. M. Veron apparently leans to the contrary opinion, but we doubt the correctness of his conclusions. To our thinking, the buildings furnish ample evidence that their builders enjoyed the method of building they had developed, and saw nothing in its frank display of construction to be ashamed of.

The concluding section on architecture, summing up the subject, contains some general remarks which are admirable, and embody some truths in regard to the nature of architecture, and the manner in which it is commonly regarded in the present day, such as are very little recognised or understood at present. M. Veron has the power, which so few seem to have, of placing himself in imagination in the position of builders of other epochs, and realising to some extent how the thing looked to those who made it. Thus he calls attention to the very important consideration that "in most cases it would be a mistake on our part to suppose that the ideas or moral impressions created in our minds by the sight of certain edifices were foreseen and intended by their authors." Our sentiment is projected back upon the building through an intervening medium of historic association; and thus, as M. Veron says, the Coliseum has probably provoked many more laudatory apostrophes in the days of its ruin and decay than when a hundred thousand spectators assembled within its walls to applaud the fight of gladiators. A very good paragraph in regard to the degree and source of architectural expression we may quote in full:—

"Architecture, in its own province, has a power of expression which cannot be denied. That it can convey an impression of calm or of boldness, of grace or of power, of religious bigotry or of gaiety" (?), "of size or of richness, the sight of certain monumental works is sufficient to prove. In our study and analysis of architectural construction, we may easily notice the reasons for each of these impressions; for example, prolonged horizontal lines create ideas of stability, durability, and weight; vertical lines, on the other hand, express boldness, enthusiasm, aspirations; the predominance of plain surfaces over voids suggests austerity and gloom; while many and various openings create absolutely opposite ideas. We must also recognise that the nature of materials and their arrangement, the various uses of smooth and carved surfaces, can either add greatly to, or much detract from, the character and beauty of an edifice. Great architects are those who are able to tell in advance, with accurate knowledge and feeling, the exact effect which all these various conditions will have in the finished building. But it is obvious that this ability cannot be acquired except by a series of experiments, in which each component part is gradually reduced to its just importance. Architecture, even when considered from the æsthetic point of view, remains so dependent upon geometry, upon mechanics, and upon logic, that it is difficult to discover accurately the share which sentiment and logic have in it."

It is very well that a book should be published in a popular form, containing so much practical sense on a subject on which there is such general misconception. Much of what we have looked at in M. Veron's book under other headings,—painting and sculpture, for example,—appears very sensible and very suggestive; and throughout the book the author looks upon art from the point of view of modern life and feeling, and is a determined opponent of the worship of academical tradition. In his chapter on sculpture he instances Carpeaux as one who has put new life into sculpture by aiming specially at the study and expression of life and movement; he is a sculptor "no longer content to reproduce attitudes; he strives to become dramatic and expressive." . . . . "All the worshippers of abstract beauty joined in denouncing him as a corrupter of public taste"; but "the public have ranged themselves on his side." This latter fact does not, after all, prove much, we may say, and it is easy to carry the sculpture of "movement and life" too far for the true capabilities of the art; but the genius of Carpeaux, and the value and originality of his contributions to modern sculpture, are of course undeniable. One is surprised to see such a subject touched upon, however, without even the mention of the name of Dalou.

One subject is referred to (p. 88), which has before now been debated in our columns. M. Veron observes that art, far from being, as some regard it, the blossom and fruit of civilisation, is rather its germ: it is the result of the search after the best, incessantly prompted by the cerebral activity which is the essential characteristic of man. It is almost impossible to quarrel with the position as here stated; but, then the meaning here attached to the word "art" is very different from that in which it is commonly used by those who maintain the "blossom and fruit" theory. Like so many other debated and debatable questions of this kind, a great deal of the difference of opinion means really a difference in the signification attached to words. We note the author's view as worth the attention of those who are interested in the question, but cannot go into the subject now. M. Veron gives pretty full and, from his point of view, logical reasons for the opinion expressed.

* Æsthetics. By Eugene Veron. Translated by W. H. Armstrong, M.A. London: Chapman & Hall. 1879.

LEONARDO DA VINCI AND MICHELANGELO.

IN the course of the last four centuries, filled as they are with the memories of many interesting names, it is but little exaggeration to say that, no two figures have stood out so prominently and so familiarly before the world,—have gratified and delighted it so continuously,—have afforded such field for study, for thought, and for inquiry,—as those of Leonardo da Vinci and Michelangelo. They are names the associations connected with which belong, and have belonged, for generations to all countries. In spite of our familiarity with their thoughts and lives, their works and friends,—familiarity the result of numerous literary studies and criticisms,—it is with no small degree of interest that any new work on the lives of these great men is welcomed by the refined world.

Amply though it is acknowledged, the debt that in this way artists owe to the literary student cannot be too thoroughly appreciated, and every effort ought to be made to throw down the artificial barriers which, with us, have been so unaccountably thrown up between the literary man and the artist; to chase away the misunderstanding, distrust, and imagined divergence of aims that it is useless to deny exist in England between these two important components of true "society."

The extraordinary admiration bestowed by the world at large, and especially by England, on French art,—an unaccountable admiration when we compare during the last hundred years the productions of the two countries,—can alone be attributed to the great intimacy which has existed in France between the artist and literary man, who have owed to each other's mutual support and almost daily intercourse more than one happy suggestion.

In France, no artist of even tolerable merit can be named who has not received his full share of credit at the hands of its literary men; while in England, the conscientious, careful work of our artists of the last hundred years has, one might almost say, with the notable exception of some few names, been only properly appreciated within a few years; and how many names are there which still remain to be drawn from an unmerited oblivion? By what almost seems an artful and constant repetition of certain favourite names in literary works (on almost every page of the best writers one may find allusions that could alone be suggested by an intimate understanding of, and friendship with, the artist), by carefully-written critiques of their works, the world has become, so to speak, completely familiar with French art and artists; while English art, lacking proper ap-

preciation, is ill-understood, and even ignored by many English people.

From this proper fellow-feeling between the artist and the literary student, which produced Vasari's "Lives," that legion of French writers of whom Charles Blanc may be said to be the typical representant, and beside whom we have only Walpole (and what do we not owe to him?), and, might be added, Dunlap's "Anecdotes of the Painters in America,"—from this fellow-feeling it has arisen that we are in possession of such a mine of information regarding the Italian painters, and especially Leonardo da Vinci and Michelangelo.

The expression of the most recent view on the works and lives of these two great men, the "Leonardo and Michelangelo" of Sig. Boito (a well-known art critic and contributor to the *Nuova Antologia* *), will be read with interest by all sincere admirers of the great art of the past, who will thank the author for the suggestion of more than one new idea regarding the complex minds and lives of two such extraordinary interpreters of the silent art.

The means and aims of Leonardo and Michelangelo were too widely different for much friendly sympathy to exist in common between these two strange natures; but, owing to this very difference, in presenting the lives and thoughts of both, some idea of their artistic aims may be formed.

In Leonardo, who himself claimed but the title of "disciple of experiment," one finds, even when he seeks to represent the beauty of human nature, something experimental; while Michelangelo, in drawing his inspiration from the source of nature, entirely recreated her impressions in his own extraordinary mind. One a philosopher in everything, far-seeing, almost a prophet, incarnating four centuries ago the spirit of the man of the present day; the other, the free, unrestrained artist, giving existence to conceptions which belong as much to the genius of antiquity as to that of modern days. It was in the school of the antique that Michelangelo was formed; Leonardo, but little a student of antiquity, still seeking to satisfy his unquenchable thirst for truth, and even repeating his axiom that experiment never fails, but only our judgment. They present the two phases of art,—the broad, profound mind which searches into the very depths of the beautiful; and the ardent spirit which precipitates itself upon the conquest of beauty as a standard may be won in battle.

The hand to which we owe the "Moses" worked with the rapidity of lightning; in three years,—tradition says in less than twenty months,—the noble poem of the Sistine Chapel ceiling was commenced and terminated. In the completion of the famous "Cena," Leonardo, we learn, employed sixteen years, and an equal time on the unfinished model of the great Sforza horse. "Patience," said the divine Da Vinci, "overcomes all difficulties as easily as cold may be averted by the addition of warm clothing."

His refined and delicate nature, devoted as he was to innate research and experiment, and adorer of the exquisite beauties of Nature, fitted him to be a painter rather than a sculptor, and painting he praises as the foremost of all arts, not taught to those whom Nature has not touched with her magic wand; not the mother of sons untold, like the printing-press; painting, honouring for ever the artist, and remaining always precious and unique.

Strangely enough, Leonardo appears little to have studied the antique. In his treatises he refers but once to the works of classic days, and then he confounds Greek and Latin; and, the pupil of Andrea Verocchio, the goldsmith, who, on the discovery of the antique statues at Rome, abandoned his profession to follow that of the sculptor, and restored the Marsyas for Lorenzo de' Medici, Leonardo, among his innumerable sketches, has only left one drawing of a horse recalling that of the Monte Cavallo,—a small drawing, resembling a Greek Faun, and but few other proofs that he ever studied, as artists study, the antique.

Whoever turns over the pages of the "Codice Atlantico," at the Ambrosiana, with its 1,600 sketches, by Leonardo (without remembering what are to be seen in England, only a small portion of what his industry has left us), cannot resist a feeling of astonishment at the fertility of his genius. Mechanics, hydraulics, physics, mathematics, geology, botany, artillery, geography, astronomy, every science then known, seems represented; and through all the hand of the artist is evident. A problem of geometry, which ends with the study of a leg; a weaving-loom, or a machine for laminating metal, adorned with some sweet female profile, or kneeling Madonna.

If in the science of Leonardo can be traced the fantasy of the artist, in the art of Leonardo may be noted the judgment of the man of science.

He is the naturalist painter, the philosophic painter, the critical painter; in a word, the painter of to-day, and Vasari (whose mine of information and anecdote writers on art have long made use of) tells us, slightly ashamed of even confessing it, in his preface to the third part of his famous "Lives," that Leonardo da Vinci gave birth to the manner "which we now call the modern."

Leonardo, remarks Signor Boito, was laconic in what regarded his affections. On the death of his father, in a MS. (now in the British Museum) one reads, "on the 9th of July, 1504, died S. Piero Davinej, notary, at the palace of the Podesta, my father, eighty years of age, leaving ten sons and two daughters." Ser Piero had had four wives; Leonardo was the son of none of these, but of a certain Catherine, who eventually married an Accattabriga. In 1457, when Leonardo was five years of age, we find the following note, "Lionardo, son of said Ser Pietro, illegitimate, born," &c. But the boy was certainly legitimate, since otherwise he could not have disputed with his brothers the inheritance of the father and an uncle,—a lawsuit which we see by letters of a later date happily caused but little ill-feeling between the relations. Regarded strictly, this indifference must be looked upon as selfishness in his character, but that selfishness which tears itself from earth to live in a paradise of art and science.

Leonardo was strange in this particular, remarks Sig. Boito, that there remains no evidence of his ever having suffered from the pangs of love, and yet Leonardo's beauty of form and feature are familiar to us all from the description of Vasari, and those portraits which exist at Florence, at Venice, Turin, and London. Michelet tells us that when the painter was at the court of Francis I., although then somewhat aged, he was copied by the king and courtiers, in the style and cut of his costume, his beard and hair. And yet in two distinct places in his *Trattato della Pittura*, Leonardo smiles at those who in his day showed a vain interest in dress.

Even in his youth, the gallantry of Leonardo must have been capricious and often neglected, for the painter had other thoughts to occupy his mind. The jokes, the repartees which more than one writer has handed down, cannot destroy the abstracted nature of the man immersed in the contemplation of nature; the painter, he once said, must live alone; and, he added, if he will be content to be alone, he will be everything.

It is important, remarks Signor Boito, that we should see the man before considering his work; especially in that art in which his nature shows itself. Michelangelo shows himself in his work; the "Moses" is Michelangolo, the nature of the artist is revealed; Raffaelle in his figures can be divined, but not so Leonardo. His Christ and Apostles, in his "Cena," are the true personages of the sublime drama in which they take so important a part. He who has imagined them has disappeared, but still remains his famous "Cena." Never has any painter, we believe, either before or after Leonardo, succeeded so completely in satisfying every critic, as has Leonardo in this work,—a work on the completion of which he spent no less than sixteen years, painting, it is true, as his contemporary Matteo Bandello tells us, according to his caprice, now giving a few touches of the brush to some portion, and as soon leaving it, to continue elsewhere some neglected work. "On some days, from sunrise to sunset, he never laid down the brush, denying himself his meals; at other times contenting himself with contemplating his work for hours together, his arms crossed," intent on the consideration of new experiments, whose results, alas! worked so soon their fatal effects.

Of his superb "Cena," injured by time and the brutality of Napoleon's soldiers, at a later period by the restorers, Sig. Boito mentions several reproductions, but neglects to speak of the valuable copy by Leonardo's pupil, Marco d'Aggione, which so many of our readers will remember in the lecture-room of the old Royal Academy, and which now holds so distinguished a place of honour at Burlington House.

Sig. Boito has carefully prepared and presented to his readers the remarks of Leonardo's numerous critics on his works in the various galleries of Europe; and sad is the tale these criticisms tell, written by such well-known professors as Beyle, Viardot, Charles Blanc, Rumoler, Clément, Delecluze, and a host of others, of the numerous pictures erroneously attributed to the great painter, of whose works so few specimens now remain. Here we stop, remarks Sig. Boito, after a lengthy review, because round the many pictures said to be by Leonardo only hangs an interminable litany of doubts and suspicions, which, he adds, the more one studies the clearer, alas! they appear.

This happened to Rigollot, who published a catalogue of Leonardo's works; as also to the Marchese d'Adda, who has written learnedly about Leonardo as an engraver, and who has denied the authenticity of the illustrations of the treatise "De Divina Proportione," by Fra Luca Paciolo; as also those of the "Trattato di Scienza d'Arme" (published at Rome in 1553), and all the others, attributing them rather to Verocchio, Mantegna, Pollaiola, and Francia, with the exception of two,—a profile of a woman and the four horses; while d'Adda concludes by the statement that no print, either in copper or in wood, can be regarded with certainty as the work of Leonardo.

Of Leonardo's numerous productions mentioned by Vasari, how few now, alas! remain! Not even the famous cartoon of the Battle of Anghiari. It was in the execution of this work that Michelangelo and Leonardo were brought face to face. Both had been commissioned by Pier Soderino, the *gonfaloniere* or mayor of Florence, to paint one of the walls of the great council-chamber; both painters prepared cartoons which gained the admiration of all contemporaries; both commenced to paint, and the works of both were left unfinished, the cartoons were lost, and we must content ourselves with Vasari's description and a few pencilled memoranda. Michelangelo's subject, adapted for his display of muscles, was the famous cartoon of Pisa; Leonardo's, the Battle of Anghiari.

Of the few reproductions left us of Michelangelo's great work, Sig. Boito has neglected to mention the superb engraving by Schiavonetti, from a drawing, if we are not mistaken, by the late Henry Howard, R.A., a work probably alone known, however, only to a few English artists and connoisseurs.

The cartoon for this great work Michelangelo completed in ten months; Leonardo, on his, spent more than two years, commencing to paint at first in oil-colour, with a composition of his own invention, of chalk, Greek pitch, linseed-oil, and white lead, which before long, however, he was obliged to abandon. Such, indeed, were the experiments he eventually practised, that a few short years after the picture was finished, it fell irreclaimably to ruin,—the fate of more than one of Leonardo's works.

This mania for experiments with varnishes and mastics, and colours, must be regarded as Leonardo's chief fault, as, indeed, it has been in every painter who has followed his example. Vasari has already told us much concerning Leonardo's method, and his admiration for low tone. He prepared, writes Signor Boito, his ground of a brown colour; he then modelled, especially the features, in neutral tints, and then tenderly finished his work in colour. His marvellous rotundity and relief arose from his profound knowledge of light and shade,—a knowledge that perhaps more than once led him into excess. It was not by dexterous brush-work that his effects were produced, not by boldness, and in the same way that he shows no wish to reveal in his work his own mind, he seems desirous to hide his manipulative power.

This was in later life, when Leonardo had mastered his methods, but while in Florence we see evidences of his perplexity amid the seducing examples of his contemporaries and predecessors. Massaccio, that ideal artist, the beloved of all painters, had died at the early age of twenty-six, some quarter of a century before Leonardo's birth. That same year (1452) Donatello was aged sixty-six; Leon Alberti, forty-seven; Fra Lippi, forty; Ghirlandaio, but three years old; Sandro Botticelli, five; Ghiberti, who, the same year, 1452, had placed at San Giovanni his second "Gate to Paradise," seventy-four; the divine Angelico, sixty-five.

In the works of this period, Leonardo is

* Ulrico Hoepli, Milano, 1879.

thoroughly Florentine, as indeed he is during the whole first thirty years or so of his life; and to which belongs Lord Norwich's famous "Virgin and Child," which Waagen has declared to be thoroughly authentic.

Sig. Boito closes his first chapter on "the painter and his mind" by a learned review of the state of art in Milan and the cities of Lombardy previously to Leonardo's arrival in the capital of the Sforza family; and we are further shown how Leonardo left no famous pupil to continue his tradition, though some of the painter's biographers have attempted to prove the contrary. Whether or no this be the case, without Leonardo's teaching Andrea Solari's works would never have been produced, and perhaps much of the admirable grace of the pictures of Bernardino Luini would have been wanting.

Even in divine natures, remarks Sig. Boito, one may meet sometimes with strange contrasts. Leonardo loved, as deeply as his own cherished art of the pencil and the brush, that of the chisel, even when declaring sculpture to be a mechanical art, causing in itself no admiration in the spectator. Whatever his expressed opinions may have been, Leonardo, we have evidence, wielded ably the modelling-tool and the chisel, though, alas! nothing remains to show us his power. While he was in Florence, in the first years of the sixteenth century, the *gonfaloniere* had held out the prospect of his being allowed to use a huge block of untouched marble lying at Santa Maria, but Michelangelo, then a youth of twenty-five, in two short years, while amply employed in the execution of numerous other commissions, saw in and worked from the unshapely mass the famous David, of which we have so interesting a reproduction in our own South Kensington Museum.

The only great work in sculpture that Leonardo ever attempted to carry out was the equestrian statue of Francesco Sforza. The disappointment, delay, the hesitation and extraordinary dilatoriness of Leonardo in the execution of this colossal work, Sig. Boito tells at length in his interesting pages. Sixteen tedious years Leonardo laboured unsuccessfully to complete the great horse, the model of which was eventually abandoned and destroyed.*

Leonardo, the pupil of Andrea del Verocchio, the author of the noble Colleoni monument at Venice, who again was the pupil of Donatello, the author of the statue of Tattamaleta at Padua,—Leonardo, with the perfection of such works before him, and the remembrance of the horses of Phidias, strove to his utmost to equal, if not surpass, the work of his predecessors. The Fates, alas! were unpropitious, and Leonardo's fame alone must rest on the record of his conscientious desire to arrive at the furthest limit of perfection.

Unhappy, he used to say, enumerating a noble sentiment, the ruling precept of his own life,—one not alone applicable to the artist's aims, but to those of every one's existence,—unhappy is he whose work surpasses his ideal; he who sees his work still far from the realisation of the ideal he has striven to attain may be on the threshhold of perfection.

We will continue the subject hereafter.

Liverpool Engineering Society.—At the first meeting of the present year held on Wednesday, the 15th instant, at the Royal Institution, Colquitt-street, Mr. Morgan E. Yeatman, M.A., president, in the chair, the chief business was the reading and discussion of a paper by Mr. J. S. Brodie on "The Disposal of Town Refuse." The author considered that in spite of the attention that has been paid to this all-important subject, and the sums of money that have been spent by various companies with greater or less results, the question as to how best to get rid of such refuse as that from dwellings, factories, and slaughter-houses remains *in statu quo*. With a view to further elucidation and discussion the present paper was written, and it gives a description of the more important schemes that have been tried for the treatment of sewage. In conclusion, Mr. Brodie believed that unless something altogether unexpected came forward, towns would have to continue to pay to get rid of their refuse just as they have to pay for their water supply.

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* In our notice of the present exhibition of drawings at Burlington House, mention will be found of sketches there made by Leonardo for this work.

CONSTRUCTION AND COMBINATION IN THE ARTS.

THE SUCCESSIVE AND THE SIMULTANEOUS.

A BUILDING or a picture is as much a poetical whole, or ought to be, as is an epic or a drama; it is a whole in virtue of being governed by one pervading purpose and expression, to which all subordinate parts contribute; those parts being subordinates in a certain hierarchical progression,—certain divisions having an approximation to a totality in themselves, but still by themselves being incomplete, such dependent parts having still their own subordinate parts until we descend at last to the purely elementary. The introduction of an element or a combination as a subsidiary member is only justified by aptitude for assisting a leading effect, and so, more or less, indispensably contributing to some ultimate practical efficiency, or to as decided a dominant and harmonious expression. It is upon the essential value of the result, whether economical, or æsthetic, or combined; and the perfection with which it is brought about and accomplished, that the standing, the rating, of the artistic whole depends. A fine subject, a cathedral or an epic, may be only half taken advantage of,—may be disgraced and deformed by excrescence and inappropriateness, and certainly a poem may be no less so.

To this extent the same general definition applies to either class of artistic achievement; but when we press the comparison further, we find that we have to ask ourselves,—How can we institute a parallel between a work which presents itself all at once, and another which comes upon us in a course of succession, whereby the impression of one moment is constantly being succeeded by a novel impression? Portal, rose-window, towers of a cathedral, come into view and remain in view together, and declare their harmonious relations as long as we like without change, without suspensions, revelations, or surprises. How are we to bring into analogy the relation of these architectural members to each other, and those of an oratorio of Handel? How shall we compare the majestic structure of a trilogy of Æschylus with the Parthenon? The problem seems like that of putting into comparison a straight line with a plane surface. To compare an elegy in a country churchyard to the church itself seems like an attempt to find a third proportional to Hyde Park and New Year's-day. Yet not altogether so. The impression which a fine building produces is not entirely simultaneous; nay, that which we owe to a narrative or a drama is not entirely to be regarded without any qualification as successive. To fully appreciate the architecture, we take different points of view. It may be agreeable, it may even be necessary, to make a circuit; and even if we restrict the case to the aspect of a noble façade, though it is certainly all in view at once, and produces a general impression at once,—if it is a work of that complexity, however made compatible with simplicity, which is ever implied by the production of the greatest effects, we do not and cannot, and would not wish to attend at the same moment to every part equally; we flit from one to another; we take them in some order of succession, quite spontaneously it may be, and compare part with part, and travel back again over the whole, and so may be conscious at last that the finest appreciation which we have realised has been as much due to the succession as to the simultaneous impressions that we have received. It is, indeed, characteristic of a fine composition in either painting or architecture, that it detains us by inviting us to go over the parts in ever-varied sequence, while the general effect is still ever present to the mind.

On the other hand, the impressions of an oratorio or of a drama are not so purely successive as they may at first be considered. What is presented to us directly and is immediately proceeding, excites anticipations, curiosities, interest as to what is to come, and at the same time even as it passes leaves an impression that does not die out, but becomes simultaneous with the next direct impression that succeeds. Even as when a musical note ceases its effect lives on by predisposing the ear for the reception of certain notes to succeed it in preference to others, the progress of the work puts us into a state of mind,—of emotional susceptibility as well as of intellectual information,—that blends from one stage to another. This progress, under the conduct of a consummate artist, works up and onward to a final climax; and so the condition of sensibility becomes gradually more and more completely under the influence which owes as much to the beginning as to the end of the system of excitement. We have been led on step by step, it is true, but so we might be if we had our first sight of a fine building as gradually emerging from a mist until after part in succession to part had been revealed, and then just as the whole came into sight, the mist should again close in and take it from our view. Let it be allowed to us, in our search after the development of the concurrence of the simultaneous with the successive in the arts, to recur for illustration to an aspect of those conditions of a National Theatre for the national drama which we have been recently discussing and have not yet done with.

Among the difficulties that have to be conquered before the requisite organisation can be achieved is that inveterate jealousy which Macready was conscious of and confesses; jealousy that an actor is apt to entertain, not only against those who play, or may play, the same parts that he excels in, but against those who play along with him. Applause given to another,—such is the candid avowal and notorious fact,—seems taken from themselves. In consequence, the ambitious, and those who have attained a certain popularity, feel that they are losers by appearing in even important parts, that by their nature do not offer the best opportunities for "bringing down the house." Next follows entire indifference to the fate of scenes in which they do not themselves appear. The inevitable consequence must be that the genuine and perhaps unsuspecting appreciator of the drama as a work of art is baulked at every turn. For the full effect which he desiderates to be realised, the secondary part should be assigned to a first-rate talent no less than the chief part; but there is a tendency for rivalry, and jealousy, and self-conceit (let us whisper), to thrust it down upon third or fourth rate talent. But Othello, in exercising such tyranny, sadly miscalculates the reaction on his own performance; he does not know that the effect of his scene with Iago largely depends, not only on the excellence of Iago in the same scene,—on what may be called the simultaneous contrast,—but on the impression which he has made, and of which the effect still tells on the spectators, still rings in their ears, and enhances or deadens their interest, in an antecedent encounter with Cassio or Roderigo.

The story is told that Mrs. Pritchard, who preceded Mrs. Siddons, neither read nor knew more of the tragedy of "Macbeth" than her own speeches and the cues that introduced them. The story may have sprung from mistake, ill-nature, or satire; but actors, even such as Garrick, have treated Shakspeare's compositions in a spirit that is, perhaps, one degree more discreditable. An actor behind the scenes,—supposing him even to be there and not in his tiring-room, not on his way to the theatre to be just in time for the call-boy, is no doubt, in a disadvantageous position for appreciating the true sentiment of scenes that he himself has no part in. We may compare him to a musician in the orchestra, who should be conceived as only conscious of the music at the time that his own instrument was in request for the score. He, too, would probably think that the rest of the performance dragged, might well be compressed, made to "go closer," and so forth. He would be likely enough to wish especially that whatever immediately delayed his own display, should be curtailed. He would have for his reward the experience that his own display would fall comparatively flat; the preparation by which a great artist introduces a fine scene in a play has the same relation to that scene as the background has to an historical picture, as the foreground has to a landscape, as a portico to an entrance-hall, a hall to the chief saloon. When Garrick cut out the boorish conundrums of the gravedigger, he was unconscious that he was destroying a contrast that would give double effect to the over-refining reflections of Hamlet by the side of the grave at his next entrance. Scene after scene is torn away from Othello, the true impression of his mental struggle is weakened in consequence; the actor has his great scenes that most he prizes intact, but relief is lost, and the noble Moor has been well proved in consequence to excite not sympathy but repugnance, pure and simple, in those unsophisticated minds that, unimbued with the omitted literature, very justly turn away from him as he has been sometimes represented so

born of surroundings. Of a truth, it is their merit and not their fault if they happen to shock the more indulgent, and the victim whom the poet sets before us at large as only succumbing to diabolical ingenuity and spite, is recoiled from and denounced by them as a sorry dupe and cold-blooded murderer.

If we ask a dramatic author what he understands and aims at as the essentials of construction, he will say most probably that construction in his art means coherence and climax; that is to say, an intimate correlation of various threads of interest and incident all converging with an accumulation of interest as they proceed to an ultimate harmonious and most highly pleasurable close. This is the meaning of the ancient doctrine of variety and unity as characteristic of art generally, of works of any considerable importance in any art whatever. Invention ranging between lightest fancy to most soaring imagination must be relied on to minister variety, and a sense of appropriate proportion govern the all-pervading unity. Where these faculties are atrophied, or hypertrophied, we know what the results are in architecture,—the results are the same in a poem or a drama. The reorganisation of the drama will be a failure unless an effective check can be instituted against secondary parts being neglected, and superior parts unrelieved, whether the check be found in an enlightenment of the actor's self-interest, or independent managerial control that can enforce itself. Apart from such control, the dramatic structure will be comparable at last to some architectural productions wherein, for anything that appears, the several features have been partially indulged,—towers allowed to assert themselves to a degree that dwarfs and seems to threaten to crush the really useful building attached to them, blank walls doing their best to crowd out windows, entrances expanding themselves till they threaten to disjoin the façade, and porticos putting themselves forward as much too important to have any consideration for requirement of space in the saloons to which they give admittance.

THE FRENCH MEDIÆVAL BUILDING TRADE.

FROM the literary researches of M. Fagniez into the early industrial history of France, we obtain several interesting particulars on the various trades to be found in Paris, including those of building; and when we reflect on the noble erections that rose up in those eras to form the French cities, it would seem not out of place if we seek to know something of those who built them. From that very ancient industrial census, known as the *Livret des Métiers*, we find that there were in Paris at the end of the thirteenth century 122 masons, 7 masons' assistants, 36 plasterers, 2 scaffold-builders (*eschafaudeurs*), 2 door-makers, 108 carpenters, 18 stone-getters from the quarries, and, lastly, some *appareilleurs*, described as master-workmen, who traced the stone dressing. Of these, the numbers are not given. There could not have been many; for, according to some, the architect himself sometimes took the duty of *appareilleur*. Indeed, there was no such person as an architect in those days, this term not having come into vogue until the fifteenth century. In the twelfth and thirteenth centuries he was designated as the master of the works, and his office was to trace the plans, calculate the quantities, buy the materials, arrange with the contractors, overlook and measure the work, and pay the men. The architect, therefore, had in most cases clearly enough to do without assuming the duties of *appareilleur*, which was probably done by master stonecutters, as the following extract seems to show:—"Me Dreufavier, tailleur de pierre, por avoir taillé et faict l'appareil aux maçons d'un portail de pierre." However this may be, the master of the works had the whole command and responsibility, both as regards material and execution, and particularly in the masonry, over which he exercised a more personal supervision than over the other details. He left, indeed, the carpentry to the care of a master carpenter, who drew the plans and estimates, though always under the eye of, and subject to alteration by, the master of the works. The latter had to arrange with everybody, as we find him in the records of the building of the College of Beauvais concluding a bargain with a tombstone cutter for putting up and polishing the tomb of Jean de Dormans, the founder; and also drawing a design for the coppersmith, in the shape of a copper crown, for the statue of the Virgin.

When the master of the works had several jobs on hand, necessitating his travelling from one to another, he had leave sometimes to appoint a substitute, whom he paid so much a day, though it was understood that the latter had no power whatever in any artistic direction, but merely in checking off certain materials or work to be done. In those days the king, the great nobles and religious establishments, had each their own properly-appointed masters of the works, generally one for masonry and another for carpentry, and the supervisors of the royal buildings were appointed personally by the king, and had a distinct position at court, giving up their office only into the hands of the royal chancellor. The following extract tells us that "Petrus Souchet, varletus camere Regis, ordinatus et institutus magister generalis operum carpenteriæ regis loco majestri Roberti Souchet vacante per resignationem ejusdem in manibus domini cancellarii factum. Idem Petrus fecit et prestitet solitum in camera juramentum." Moreover, besides their salary and certain gratifications, they had each two horses at their disposal and at the royal household's expense. Indeed, in all building matters it was the custom for the owners of the buildings to testify their satisfaction with well-done work by occasional honoraria. In 1362 the Duke of Normandy gave his master-mason, Raymond of the Temple, 20 francs in gold, and when he became king he made him one of his sergeants at arms, and gave 200 francs in gold, wherewith Raymond's son, Charlot, to whom the king was godfather, and who was studying at the University of Orleans, might pay for his keep and buy books. Louis of Orleans also gave the same sum to Raymond, who, apparently, was in luck's way, for his services as architect of Orleans aux Celestins. Occasionally a good bit of money was made by the masters of the works selling the materials *sub rosa*, and pocketing the proceeds, though precautions were sometimes taken to make this impossible. Of this a case in point happened in 1402, when the materials for one of the royal buildings, consisting of wood, lead, iron, carpentry work, scaffolding, glass, and sashes were shut up in a warehouse, with two locks and keys, of which the master of the works held one and the accountant the other, so that any misdemeanour could only be carried out by collusion between these two. At the conclusion of the operations, the materials which were left were sold by the receivers in the presence of the master of the works, *au prouffict du Roi*. Although in ordinary cases the master of the works was also pay-clerk, the royal household included a special functionary for this office, which was sometimes a confidential one, Philip the Long having appointed his valet to discharge this duty. We find extant one of these certificates of payment, as follows:—"Jehan Frangile, maistre des œuvres de charpenterie du Roy nostre sire, à Guillaume, receveur du Roy, salut. Je vous certifie que Regnault de Gastins, masson, a bien guagné et deservi, et lui est deu sept livres trois sols tournois pour avoir fait et parfait les besonges qui ensuivent. Tesmoing mon seel à ces presents le xe jour de Fevrier l'an MCCCLX. et seize."

In cases where an expert's opinion was wanted, the master of the works himself acted, although this was sometimes done by masons and carpenters specially sworn to act (jurés du roi). In all building affairs connected with the royal household, there were two of these officials, one for masonry and the other for carpentry, but in other cases we hear of juries of eight or even twelve. They were personages of some consequence, being nominated by the master-mason of the king, and instituted by the provost of Paris, who adminstered the cath to them. In 1402, a case occurred in which one Jean Priem disputed the right of Pierre Denis to be properly elected, though the provost confirmed the election, and maintained his right. When Pierre Denis died, there was again a contest, so that it is clear that the office was one of considerable importance in the trade. Various mentions are made of occasions in which the services of this jury of experts were called into requisition, and must have been of decided utility in the government of the city. For instance, in 1326, one Souplicet, a chasuble maker, presented a petition that the jury should assemble and report on the condition of the adjoining house, which threatened to come down and involve his own property in the ruin. The jury came, saw, and approved of the petition, putting their seals to an order that the insecure house, the property of Isabelle de Trambley, should be at once pulled down. Again, in 1334, Philip of Valois authorised Guillaume Judet, chaplain of St. Michel's chapel, to break through the wall of his house, which adjoined the street of the Grand Pont, and to build there workshops, the receipts from which were to be applied to the maintenance of the chapel; at the same time he gave instructions to his experts to visit the place and report as to where the wall could be pierced at the least inconvenience to the neighbourhood.

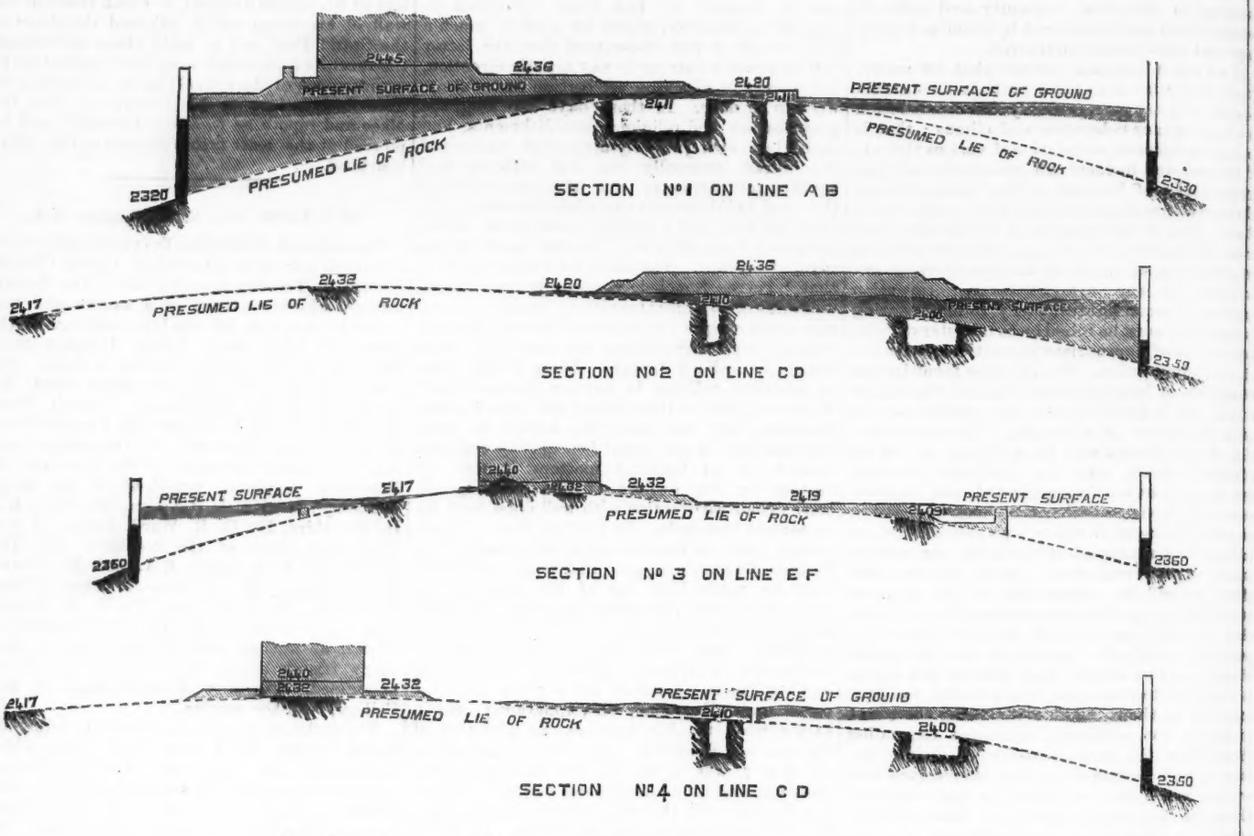
THE LATE MR. E. M. WARD, R.A.

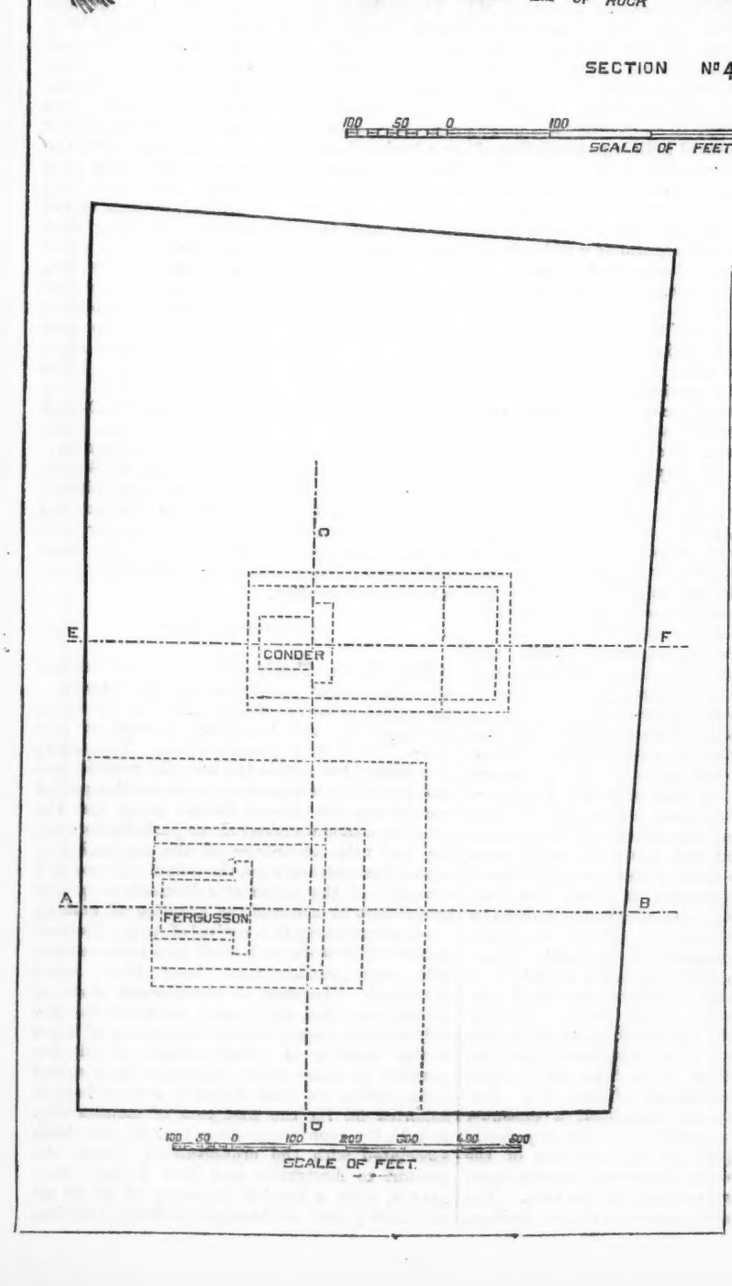
THE remains of this excellent artist and much-esteemed man were interred at Upton Church, Slough, on Tuesday morning last. The funeral *cortége*, which consisted of a hearse and four mourning coaches, left the late residence of the deceased, Glen Aray Lodge, Osborne-road, Windsor, shortly before twelve o'clock. The first carriage contained his three sons, Mr. Leslie Ward, Mr. Wriothesley Russell Ward, and Mr. Stanhope Ward, and Mr. Charles Ward, brother of the deceased. In the second were Mr. E. Chappell, son-in-law of the deceased; Sir Frederick Leighton, president of the Royal Academy; Mr. Millais, R.A.; and Mr. Frith, R.A. In the third, Mr. G. R. Ward, father of Mrs. Ward and uncle of the deceased; Mr. Tom Taylor, Mr. E. M. Barry, R.A., and Mr. Beavis. In the fourth, Mr. S. Evans, of Eton College; Dr. Collins, Mr. Ashton, and Mr. W. B. Holderness. The *cortége* arrived at the interesting old church about half-past twelve, where a great many friends of the deceased had previously assembled. The Rev. Edward Hale, of Eton College, read the service.

The melancholy circumstances attending the death of Mr. Ward have been made widely known, and have only excited feelings of sorrow and commiseration. He had suffered from a long illness, and had become subject to fits of depression, one of which overmastered his reason. His rare ability as a painter, and his high character as a husband and father, have already been the theme of many warm notices, the result to a certain extent of a reaction. For some time past a certain school of critics, admirers of the smeary and the incomplete,—of suggestion rather than depiction,—have treated his works with neglect if not with depreciatory comments, and this treatment we have reason to believe had tended to aggravate his illness and embitter a portion of his life. Posterity will do him more justice. He has left a number of works which his country will not willingly let die. Some short time ago, as many will be glad to hear, the Council of the Art-Union of London adopted for engraving his interesting picture "Dr. Johnson in Lord Chesterfield's Antechamber," which is now in the hands of Mr. Lumb Stocks, and a series of drawings by the artist himself from his principal works in the Westminster Palace, reproductions of which, together with those of pictures by Mr. Cope in the same building, will form a book for distribution to the subscribers hereafter.

The Slate Trade.—A manifesto bearing upon the present position of the slate trade,—the staple industry of North Wales,—is being circulated by the Executive Council of the North Wales Quarrymen's Union. The trade, it is stated, has within the last six months got into one of the strangest and most sudden panics ever known, the present danger being lest the employers should endeavour to push matters too far, and take advantage of the stagnation to repeat their attack upon the union. The council complain of the apparent reluctance of quarry proprietors to continue the practice of making stock preparatory to a revival of trade, the men preferring to work such stock at a most reasonable price rather than have their hours shortened. Looking at the present state of affairs, and that the reason assigned for the reduction of wages and the shortening of hours is the inability of quarry-owners to sell the quantity of slates made, the union has resolved upon voting to each member emigrating to America 3*l*. for the first year of membership, and 1*l*. for each succeeding year he has been associated with the organisation; double the amount to Australian and New Zealand emigrants, with a further premium of 2*l*. to all emigrating west of Chicago or to South America.

HEROD'S TEMPLE.





HEROD'S TEMPLE.

SIR,—In the speech with which Mr. Fergusson closed the discussion on my paper, "The High Sanctuary at Jerusalem," read before the Royal Institute of British Architects, he confined the issue between us to the following points:—

"There are two points," he said, "and practically only two, that require to be settled before the argument can be placed on a firm basis. The first is, what was the site and dimension of the Temple of the Jews? The second is, were these known, or were they not, during the time that elapsed between Constantine and the Crusades?"

The issue thus raised is so distinct, that I hope you will allow me to state my case in your columns, as succinctly as possible; especially as my duty did not allow of my being present at the discussion which is now closed, and it might appear that by silence I owned myself unable to take up the very fair challenge thus offered.

Mr. Fergusson considers that Herod's Temple occupied a square of 600 ft. side in the south-west corner of the Haram enclosure. This theory I endeavoured to show was open to objections both in plan and in section. Without repeating what has already been said, I wish to dwell on two points, in which I consider my own plan to have the advantage.

First, as regards section, I urge that the position which I advocate agrees with the general description given by Josephus, and with the levels recorded in the Talmud, while that of Mr. Fergusson does not so agree. Secondly, as regards plan, that my plan of the outer court, 135 cubits square, agrees with the Talmudic description and with Josephus, while that of Mr. Fergusson does not. These two points I will endeavour to make clear as far as possible.

1*st.—Section of the Temple Courts.*

In order to render this plain, I have sent four sections:—

1. Section A B.—East and west through the centre line of the Temple, according to Mr. Fergusson's restoration.
2. Section C D.—North and south through the Altar Court, according to Mr. Fergusson.
3. Section E F.—East and west through the centre line of the Temple, according to my own theory.
4. Same section as No. 2, but showing the Temple in the position which I suppose correct.

I have shown in these sections the points where, by actual examination of the ground, the level of the rock has been ascertained, and I have dotted the lines joining these points giving the presumed lie of the rock when not visible. The heights given are level above the Mediterranean. I have also shown the level of the present surface of the ground, which gives the superior limit for the rock levels where not known.

Any one looking at these sections will, I feel sure, be struck with the immense depth of foundation required in Sections Nos. 1 and 2. The heavy walls of the Temple can only have been founded (as are the great outer walls) on rock. Now, even if the rock were immediately beneath the surface in Section No. 1, foundations of 30 ft. would be necessary according to Mr. Fergusson's theory; and if the rock slopes evenly, as shown, foundations of 90 ft. are required. In the same way, foundations of 50 ft. are required in Section No. 2.

Turning to Sections 3 and 4, the greatest amount of foundation is only 8 ft., and the reason is plain: the Temple descended in terraces, and in order to fit the section to the ground, the highest terrace must be placed at the top of the hill.

A few words of explanation are necessary to show how the levels of the Temple courts are obtained in the sections.

As regards Nos. 1 and 2 I have followed Mr. Fergusson's statement (Transactions, R.I.B.A., 1878-9, p. 54), giving 24 ft. 9 in. between the Court of the Gentiles, and the floor of the Holy House, as the total difference of level. The Court of the Gentiles cannot be placed lower than 2,420 ft. above the Mediterranean, according to Mr. Fergusson's theory, as the rock appears at that level, though at a considerable distance, on the north, within the court in question. The floor of the Holy House was, therefore, within 3 in. of 2,445 ft. above the sea, as shown.

I do not, however, thereby mean to admit that Mr. Fergusson is right in the difference of level thus given. It does not agree with the Talmud in any respect, and I venture to say is entirely unsupported by any authority. The levels given in the tract Middoth of the Talmud depend on the number of steps between the courts and on the categorical statement (Middoth, ii., 3), that the steps were all half a cubit high. The levels are as follow:—

	Steps.	Cubits.	Feet.	Level.
Outer Court	0	0	0	2,411
Court of Women.	12	6	8	2,419
Court of Israel ...	15	7½	10	2,429
Court of Priests..	—	2½	3	2,432
Temple Floor ...	12	6	8	2,440
Total.....		22		

The cubit is taken at 16 in., for which I believe there is sufficient evidence, though space forbids my entering on that subject at present.

Not only is my section in accordance with the Talmud, but it meets the description given by Josephus, when he says that the Temple stood on a strong hill (λοφος); and that "the plain on the top (τὸ ἀνωτατώ χθαλαμὸν ἀυτῶν; *i.e.*, "the topmost [*superl.*] flat place was hardly sufficient for the Holy House and the Altar." (Bell. Jud., v. 5, 1).

According to my restoration, the Temple does so stand on the topmost flat place. According to Mr. Fergusson's theory it stands on a slope, the lowest court being on the highest ground.

2nd.—The Court of the Women.

The main objection to Mr. Fergusson's plan is, that his Temple provides scarcely any accommodation for the congregation. It is like a church without a nave, or a theatre with only a stage and a corridor. In the tract Middoth, ii. 5, we read "The Court of the Women [*Azrath han-Nishim*], its length 135 cubits, its width also 135 cubits." This statement is followed by all writers except Mr. Fergusson, who makes the width east and west only 35 cubits. We may fairly ask the very simple question, Has he any written authority for this alteration?

The manner in which he treated the question at the Institute is shown by the following remarks:—"In other words he [Lieut. Conder] assigns 1,485 square cubits to the *Men* of Israel and 18,225 to the *Women*. Credat Judæus."

This supposed disproportion of space results, however, from a misconception easily explained. The space of 135 by 135 cubits (18,225 square cubits) was devoted to men and women together. There did not exist in the Temple any separate court of the men, as Mr. Fergusson supposes. The space of 1,485 square cubits (11 by 135) was a narrow stage on the west of the larger court, and raised 7½ cubits above it. It was called the *Court of Israel* (*'Azrath Israel*), not *Court of the Men*, and it had a peculiar use which may be briefly explained.

The priests were divided into orders (*Mishnaidth*), of which one only served in the Temple at a time. To each order were attached a certain number of laymen, called "standing men," who came up to Jerusalem, with the priests, as representatives of Israel, and attended every Temple service for a week. They stood to worship in the Court of Israel, which was named from them.

Mr. Fergusson supposes the Court of the Women to have been exclusively devoted to the use of Jewish women. It is a pity that he should have trusted to Dr. Barclay's translation. The following passages are clear with regard to the question.

"They surrounded it [Court of Women] with a balcony [*cisusra*] inside, that the women might look from above, but the men from below, lest they should be mixed" (Middoth, ii., 5).

"All the Jews went into the second court as well as their wives. Into the third went the Jewish men when they were clean and purified [*i. e.*, the standing men], into the fourth went the priests" (Contra Apion, ii., 8).

The Court of Israel is omitted by Josephus in his other descriptions (Antiquities, xv. 11, and Bell. Jud., v. 5), where he only enumerates *three* courts.

The proper authorities to consult on this question, and those from which the above information is acquired, are Surenhusius' "Mishnah," Constantine l'Empereur's edition of the Middoth (pp. 60-67), and Baxtorf's Talmudic Lexicon. To these I beg to refer Mr. Fergusson. As regards the plan and sections accompanying this paper, the information is all to be obtained in the Ordnance Survey Notes, by Major Wilson, R.E., and in the "Recovery of Jerusalem" by Col. Warren, R.E.

The second question raised by Mr. Fergusson may be more briefly treated. The following are all the descriptions of the Temple area which I have been able to collect dating between the fourth and twelfth centuries.

Bordeaux Pilgrim (333 A.D.).—"In the sacred enclosure [*æde*] where the Temple stood, which Solomon built in marble, before the altar is the blood of Zachariah. . . . . There are two statues of Hadrian, and the pierced stone [*lapes pertusus*] is not far from the statues, to which the Jews come each year and anoint it."

Eucherius (427-440 A.D.).—But the Temple in the lower part of the city situated near the east wall, and magnificently built, was once a miracle. A certain pinnacle of one of the walls stands above the rest which are destroyed to the foundation."

Theodorus (530 A.D.).—"And you come to that pinnacle of the Temple where Satan tempted our Lord Jesus Christ. And there is a basilica placed on a cross" (*in cruce posita*).

Arculphus (700 A.D.).—"On the spot where the Temple once stood, near the eastern wall, the Saracens have now erected a square house of prayer in a rough manner. . . . . that will hold about 3,000 men."

St. Willibald (723 A.D.).—"He went to the porch of Solomon where is the pool where the infirm wait for the motion of the water."

Bernard the Wise (867 A.D.).—"To the north is the Temple of Solomon having a synagogue of the Saracens. To the south of it are the iron gates."

All that can be deduced from the above passages seems to me to be that the Temple was supposed to have stood somewhere in the Haram inclosure. It is mentioned as being near the supposed site of the Pool of Bethesda, which, in the fourth century, was identified with the Twin Pools at the north-west corner of the Haram (see "Onomasticon," s. v., and "Bordeaux Pilgrim").

If I have omitted any known account belonging to the period bearing on the subject, I should be grateful to any one who will point out the omission.

CLAUDE R. CONDER, Lieut., R.E.

Social Science Association.—At a meeting of the Association to be held on Monday evening next, the 27th inst., a paper by Mr. Harold Brown, "Defects of Joint-Stock Banks, and Suggestions for their Remedy," will be read and discussed.

CHARLES JAMES KEMP, ARCHITECT.

THE late Mr. C. J. Kemp, who died on the 15th of last November, in the Albert-road, Peckham, was formerly an architect in fair practice. He held the appointment of architect and surveyor to the Licensed Victuallers' Asylum in 1846, and for many subsequent years. The chapel, chaplain's house, court-room, board-room, and library in that institution were erected from his designs. In the chapel is a marble tablet inserted, recording the death of Mr. Kemp's father, chairman of the Asylum, A.D. 1846. The chapel, which forms the central and most conspicuous feature of the Asylum, was erected in the year 1850. Mr. Kemp also planned and superintended the erection of the large block of buildings known as he "Ladies' Wing," in the same institution, as the foundation-stone records as follows:—

"This Stone was laid by
H.R.H. PRINCE ALBERT, K.G.,
June 2nd, 1849."

Then follow the names of the committee, and "C. J. Kemp, architect." The whole of these buildings are of a Classic style of architecture, but Mr. Kemp was also a student of Gothic art. About the same period as the above erection he designed and erected a quaint-looking little inn, called the Queen Elizabeth Tavern, adjacent to the above Asylum. Attached to this inn is a room erected originally for a Freemasons' Lodge, and containing copies, in plaster cast, of details from Westminster Abbey and many of the cathedrals; in fact, it is a sort of miniature Architectural Museum, and is worthy of a visit by any one who happens to be passing that way.

Mr. Kemp was sixty years of age at the time of his death, and, it is to be regretted, died in destitution. He leaves a widow and children quite unprovided for. Some friends of the deceased are endeavouring to gain admission for the widow in the above-mentioned Asylum, and it is to be hoped that success may crown their efforts. W. F. POTTER.

CASES UNDER METROPOLITAN BUILDING ACT.

DISTRICT SURVEYOR FOR EAST HACKNEY (NORTH) *v.* SNEWIN BROS.

THIS case was heard at Worship-street Police-court, before Mr. Bushby, on the 19th of December, 1878, and the 16th of January, 1879.

An outbuilding (400 ft. 1 in.) had been erected against the residence] No. 102, Clapton-common (1,300 ft. 4 in.), but it had no internal communication with the house.

The district surveyor, following the decisions in the cases of Badger *v.* Corbett (*Builder*, 19th March, 1859), District Surveyor of St. Margaret's *v.* Biss (November, 1871), and Metropolitan Board of Works *v.* Flight (*Times*, 19th June, 1872), regarded the outbuilding as an addition to the dwelling, and claimed 1*l.* 12s. 6d., a half-fee, upon the area and stories of the house and outbuilding together (1,400 ft. 4 in.).

The solicitor for the defendants contended that the outbuilding was a separate building, and the fee charged should have been 15s., as for a new building under 400 square feet in area, and one story in height.

The magistrate gave a written decision as follows:—

"Two questions arise here,—

1. Does the separate entrance make this a distinct new building instead of an addition?

2. If not, is the half-fee to be reckoned on the single story and the area of the addition, or on the stories and area of the original building, plus the addition?

As to the first question, I think that the new building being subordinate to and for the commodity of the original building, the separate entrance only makes the former an attached building as distinguished from what with a common entrance would be a mere extension of the original building. The note to the second schedule provides expressly for an attached building by ordering that its area shall be added to that of the main building in estimating the fee for the whole. And this would be for the owner's benefit] where, instead of being, as here, a subsequent addition, the attached building was constructed together with the main building, *e.g.*, where the area of the main building was 300 square feet, and that of the attached building 100 square feet, both would be covered by a single minimum fee of 30s.

As to the second question, I adopt Mr. Arnold's reasoning in the case of the District Surveyor of St. Margaret's, Westminster, *v.* Biss, viz., that an 'addition' falls within the same rule as an 'alteration.' Now, if instead of an addition, say a chimney had been altered, the half-fee which is to be reckoned on stories and area could be reckoned only on the stories and area of the main building, including the chimney.

That method, therefore, must be followed here, and the defendant is ordered accordingly to pay 32s. 6d. claimed, and 2s. costs. (Signed) H. J. BUSHBY."

STEAM LAUNDRY BUILDINGS AND MACHINERY.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY.

AT a meeting of this society held on the 16th inst., Mr. C. H. Driver, F.R.I.B.A., president, in the chair, Mr. W. C. Street read a paper on steam laundry buildings and machinery, in the course of which he said:—

The evils or dangers which are generally attendant upon the ordinary methods pursued in laundry work, and which have been enumerated by such papers as the *Lancet* when discussing this question, are, generally, the many chances of infection with many subtle, painful, disagreeable, or even deadly diseases. In addition to this, there are the minor discomforts ordinarily experienced in our dealings with our washerwomen, and the great damage done to our property by the use of chemicals, scrubbing-brushes, torsion or wringing, and other violent usages. The editor of the *Lancet* has his own idea of a perfect laundry, and describes it fully under date of the 24th of November, 1877. The following are the essentials as given in a summary at the end of the article:—

(*a.*) The avoidance of any personal contact with the clothes until after purification.

(*b.*) The complete separation of foul linen.

(*c.*) The riddance of filth by shaking in running water charged with a disinfectant.

(*d.*) Drying at a high temperature to desiccate the loosened dirt which may adhere to the fabric after the first washing.

(*e.*) Shaking in a strong current of air to discharge the dried particles.

(*f.*) Isolation of the disinfecting staff who work in the receiving-house.

(*g.*) The whole of the workers in the "model laundry" should be kept under sanitary supervision, which should extend to their homes.

To nearly all, if not all, of the above it would perhaps be very proper to subscribe, given two conditions,—(1) an unlimited command of money, and (2) that perfection is attainable. These two conditions are, however, precisely the very ones which, by their invariable absence, constitute the chief difficulty of all our tasks, and we must accept just so much as is possible at the present, and hope that in times to come matters may be still more improved. Any one who would now undertake to fulfil, in a practical and remunerative manner, all the requirements enumerated by the editor of the *Lancet*, would be either very foolish, or possess an entire disregard for truth. The collection of the linen must always be carried on in pretty much the same manner as at present, only improved by providing large and clean vehicles and receptacles, as well as receivers. The linen, on its arrival at the laundry, can be sorted or divided into the several classes requiring various or separate treatments. Any consignment of linen that is suspected of infection should be conveyed to the laundry in an air-tight receptacle, and put bodily into the disinfector, and after a thorough disinfection, by subjection to steam under pressure, equal to a temperature of 274°, which will destroy all germs of disease, it can be sorted in the same way as any other linen. Passing from the sorting-room, the linen should be taken into the several washing-houses or rooms to be washed, boiled, rinsed, blued, &c. It can then, instead of being violently wrenched and wrung, have the superfluous water taken from it by being placed in a circular machine, called a "hydro-extractor." This machine has wirework sides, and spins round at the rate of 2,000 revolutions per minute. The centrifugal action presses the linen against the wirework sides, and the water passes out through them. The linen should next be taken to the drying-room, where it can be dried either by being put on horses and thrust into a hot closet, or, as in the case of flannels, which ought not to be dried too quickly or in too great a heat, be placed on lines above the hot closet; or, as in the case of lace curtains, &c., be stretched upon frames, and subjected to a similar moderate temperature. The usual temperature of the hot closet should be about 140° Fahr., and that of the floor on top of the closet about 90°. From the drying-room the linen should be taken into a calendering and mangling room, where as much as is possible of the finishing can be done by steam machinery. From here it must be passed into the hands of the ironers, &c., by whom it is finished up and prepared for passing into the sorting and packing room. In the West End Steam Laundry, in which I have had the honour to be interested as the architect, the several operations are there conducted as nearly as possible in the order described. There are many kinds of washing-machines in the market, and anybody intending to purchase, on either a small or a large scale, should be very careful and patient in making every inquiry as to which is the best for the particular kind and quantity of work. In some instances a rotary machine, where the clothes are subjected to the action of hot water and steam, with the addition of soap and soda, will be sufficient. But where, for instance, the linen of a labouring population is to be cleansed, there should clearly be some more powerful mechanical means for purging the clothes of the accumulated perspiration and foulness, and for these purposes a shuttle, or a machine with a beater, would be better. For general purposes a machine called a "Whitster" would seem a very ingenious contrivance, as it squeezes the clothes with an elastic pressure against a vibrating wash-board, and each time the press recedes the roll of clothes turns round a portion of its circumference, so that at every stroke the fabrics are squeezed in a different position. For the extraction of the great bulk of the water after the washing, boiling, and rinsing have been performed, nothing can be better than the "hydro-extractor" already described. The arrangement of the drying-closets is a matter of the highest importance, as there should be a constant admission of hot dry air into the closets, with a concurrent exhaustion of the supersaturated air. If this is not attended to, the clothes will be taken out of the closets heated, but not dried. In some cases the drying-closets are heated by steam-pipes, and in others by flues from the ironing-stoves. I would suggest the latter as being preferable, and that the hot-closets should, if possible, be placed at a little distance from the moist atmosphere of the wash-houses. The creation of a vacuum or exhaust for the removal of the wet air from the closet, as the moisture is evaporated from the clothes, must be very carefully managed and regulated. In some cases it may be effected, as has been done by Mr. Howland, the manager of the West-End Laundry, by placing a steam jet near the exit of the exhaust-pipe, and thus sucking the air up. It would perhaps be better effected if the steam were passed in an annular space, similarly to that by which exhaust is occasioned in Smith's vacuum brake. It can also be done by a fan, or by connexion with the draught of the boiler-furnace. It would also be easy to devise a simple means for regulating the rate of the exhaust so as to suit the state of the atmosphere, and to maintain the drying-closets at any required heat. The calendering-machines are very ingenious, performing ordinary descriptions of ironing and folding by passing the linen between two cylinders heated by steam. The mangle is an ordinary form of mangle similar to that worked by Mr. Mantalini, only it is operated by steam instead of manual labour; the workpeople in time become so expert in feeding it as to take out and put in fresh rolls of linen without stopping the machine. With regard to ironing-stoves, there is still room for improvement in the way of maintaining an equal heat all over the stove, and with regard to economy of fuel,—a great deal of heat passing extravagantly up the chimney. Where the stove is utilised for heating the drying-closets, as before mentioned, there must be an obvious economy. In designing a range of laundry buildings, the details must be regulated by the extent and shape of the available ground. Where, as in the case of the West-End Laundry, there is plenty of space, I should consider it preferable that they should be all on one floor, as permitting greater ease of transit from one department to another, and affording opportunities for shutting off the steamy wash-house from the drying and finishing rooms. Particular care should be paid to the buildings being sufficiently lofty, well ventilated, and well lighted, and all direct communication with the sewers must be avoided. The roof-principals must be sufficiently strong to admit of shafting being attached to them without causing vibration, and this can be done without needless waste of material. It is better, in many respects, to have overhead shafting rather than bracketed. The engine used at the West End Laundry is an ordinary horizontal engine, of 15-horse power, and the steam is generated in a vertical Field boiler, the latter being selected as doing away with the tall chimney-shaft which would have been required for a Cornish boiler. One of the sources of infection, that from workpeople, should be carefully guarded against. In the case of the laundry I have spoken of, it is proposed by the proprietor to build cottages for his workpeople, so as to offer extra inducements to good hands, and to gradually concentrate the required labour on the site, where it can be placed under medical supervision. I had intended illustrating this paper with plans of other laundries, and of the different machines employed; but on talking to one or two of the manufacturing laundry engineers, they appeared so very jealous about showing plans which they said were the results of vast experience and expense, that I abandoned the idea. We are, all of us, tempted to invest our particular callings with a certain degree of mystery, but I would ask young architects and engineers to be of good hope, for though many of the existing laundries and many of the trade machines are very good, there is still room for great improvement. While, too, there is a large population, to a great proportion of whom cleanliness is valuable, there must be a demand for such buildings and such machinery. In the planning of laundry buildings, if the general requirements are kept steadily in view, and there is a judicious selection of the best available machinery, the result in competent hands cannot be so very far wrong.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

AT the third meeting of the session, Mr. Thomas Morgan, F.S.A., in the chair,

The Rev. Mr. Chandler reported the discovery of the altar slab of Waterbeach Church. It is of grey marble, and has been supported by six pilasters, fragments of which were found.

Dr. Woodhouse, as a warning to antiquaries, exhibited a large collection of forged articles, the work of the firm of "Billy & Charley," whose productions were more frequently met with a few years ago.

Mr. Loftus Brock, F.S.A., described an African jug of modern date, having the form and colouring of early times, being an example of the continuance of ancient types in the country.

Mr. Gordon Hills reported that several fragments of Roman date had been found in Chichester Cathedral, indicating the prior existence of Roman buildings on the site. He exhibited red tesseræ and Samian ware, and spoke of flue tiles having been found.

Mr. Hills then read the first paper, descriptive of the recent discovery of a remarkable series of earthenware vessels at Leeds Church, Kent. They are built up over the arches of the nave, and were inserted probably in the belief that they would help the acoustic effect of the building. The arches are of the fifteenth-century date, but the jars appear to be older. The subject of acoustic pottery in churches was dwelt upon at length.

Mr. De Grey Birch, F.R.S.L., commented upon the peculiarities of the inscriptions.

Mr. Roach Smith, F.S.A., reported the discovery on the Allier of the site of a Roman manufactory of small statuettes of white clay, and exhibited a series of photographs of the most interesting kind. These articles are of rare occurrence in England.

Mr. Morgan read the second paper, taking for his theme the positions of the Roman armies in North Britain in the second and third centuries, the positions being indicated by numerous evidences which were passed in review, while recent discoveries were mentioned which offered additional information.

The third paper was by Mr. W. C. Little, who traced the course of a Roman road across the Cambridgeshire fens, and described its construction of gravel upon a layer of branches. It is generally 25 ft. wide.

Frost and the Water Pipes.—We have received a bundle of letters asking whether, when a lead pipe bursts, the mischief is done during the process of freezing, or that of thawing, and hinting at some fresh theory on the subject. Our early teaching was to the effect that it is the force with which the water takes the form of crystals in freezing that rends the pipe, the mischief not showing till the thaw comes; nor are we aware of any proof to the contrary. But this is a day of upsettings, and we are always willing to learn.

ANCIENT HOUSE IN CLARE, SUFFOLK.—FIFTEENTH CENTURY.

ANCIENT HOUSE IN CLARE.

THE house, of which we give an illustration, is situated close to the churchyard, at Clare, in Suffolk. It is an interesting example of a house of the fifteenth century, with a remarkably pretty "barge-board," composed of pierced tracery work, and some well-designed wooden corbels, and picturesque square-headed windows containing their original tracery and glazing; but the most remarkable feature about this house is the treatment of the plaster-work. Whether this is cöeval with the building or not is a question, probably the greater part of it is of the same date as the rest of the house, but it has been considerably mended and patched up, though at the same time preserving the original design. The kind of Indian shawl pattern, and the winged beast below the window, are very remarkable. But the heart (if it is intended to represent a heart) and the scroll-work in the upper part of the gable, seem of a more modern character. The whole is, however, an exceedingly interesting example of plaster-work as treated for purposes of external decoration, and we more especially call attention to it, as from year to year these specimens of the domestic architecture of the Middle Ages are disappearing.

TYNEMOUTH CHURCH.

THE monastery and first church at Tynemouth were built during the reign of Edwin, king of Northumbria, possibly mainly of wood, and were reconstructed of stone during the seventh century. The remains of St. Oswald were buried there. The monastery suffered very much from attacks from the Danes, and was rebuilt several times. Earl Tosti refounded it in the eleventh century. In the thirteenth century the eastern portion of the church was rebuilt. A stone screen was erected across the eastern arch of the nave, and the nave was set apart, as at St. Alban's and elsewhere. The church was finally ruined in 1665, more by wilful destruction than by decay and exposure to the weather.

Two or three years ago the late Sir G. Gilbert Scott was requested to prepare plans for its restoration, and if these should be carried out the interior will take the appearance presented by the accompanying view. It is a project which Sir Gilbert Scott had much at heart.

PARTY WALLS: THE LAW AND THE PRACTICE.

ARCHITECTURAL ASSOCIATION.

AT the ordinary meeting of this Association, on the 17th inst., Mr. Thomas Blashill read the following paper on the above subject:—

There exists in London a long-established custom of building between adjoining houses, not two separate external walls,—one standing upon the ground of each owner,—but one wall, the centre of which is usually placed perpendicularly over the boundary-line of the two properties, which wall is known as a "party-wall." The obvious convenience of this arrangement, both as saving space and reducing the cost of building, has caused it to become general in places where land is valuable; it is therefore of importance that those who have to deal with such property should be acquainted with the laws relating to it, and with the difficulties most likely to be met with in the course of practice. Although the subject is not very simple, I hope to submit it in a shape that will lead to useful discussion.

In London the law in respect of party structures is contained in the Metropolitan Building Act, 1855, the provisions of which have been embodied in the Local Acts of some other towns. To this Act I shall limit the subject; for where it is not in operation, the rights and duties of parties who are presumed to be tenants-in-common of a party-wall are not so much matters of general interest and importance as is the case where such walls are the usual mode of separating buildings from each other.

What is a party-wall? The Act says, in the interpretation clause, — "'Party-wall' shall apply to every wall *used, or built in order to be used*, as a separation of any building from any other building, with a view to the same being occupied by different persons." This is generally satisfactory, and a wall standing as the separation between the rooms of two houses may almost safely be considered to be a party-wall. But there are cases in which, on examining the construction and the elevations of two houses, A and B, it is clear that A has first been built as a distinct and complete house, and that B has afterwards been added, the wall in question having been made use of, perhaps surreptitiously, and the deeds relating to A may show that the ground upon which the whole wall stands was conveyed to the owner of it. I think that when this is clearly seen, the wall must be considered to be the external wall of the house A. The wall was certainly never built in order to be used as a separation of the two buildings, and the true boundary-line of A seems to be at the outer face of the wall, while the house B was wrongfully built without any external wall on that side. Although many

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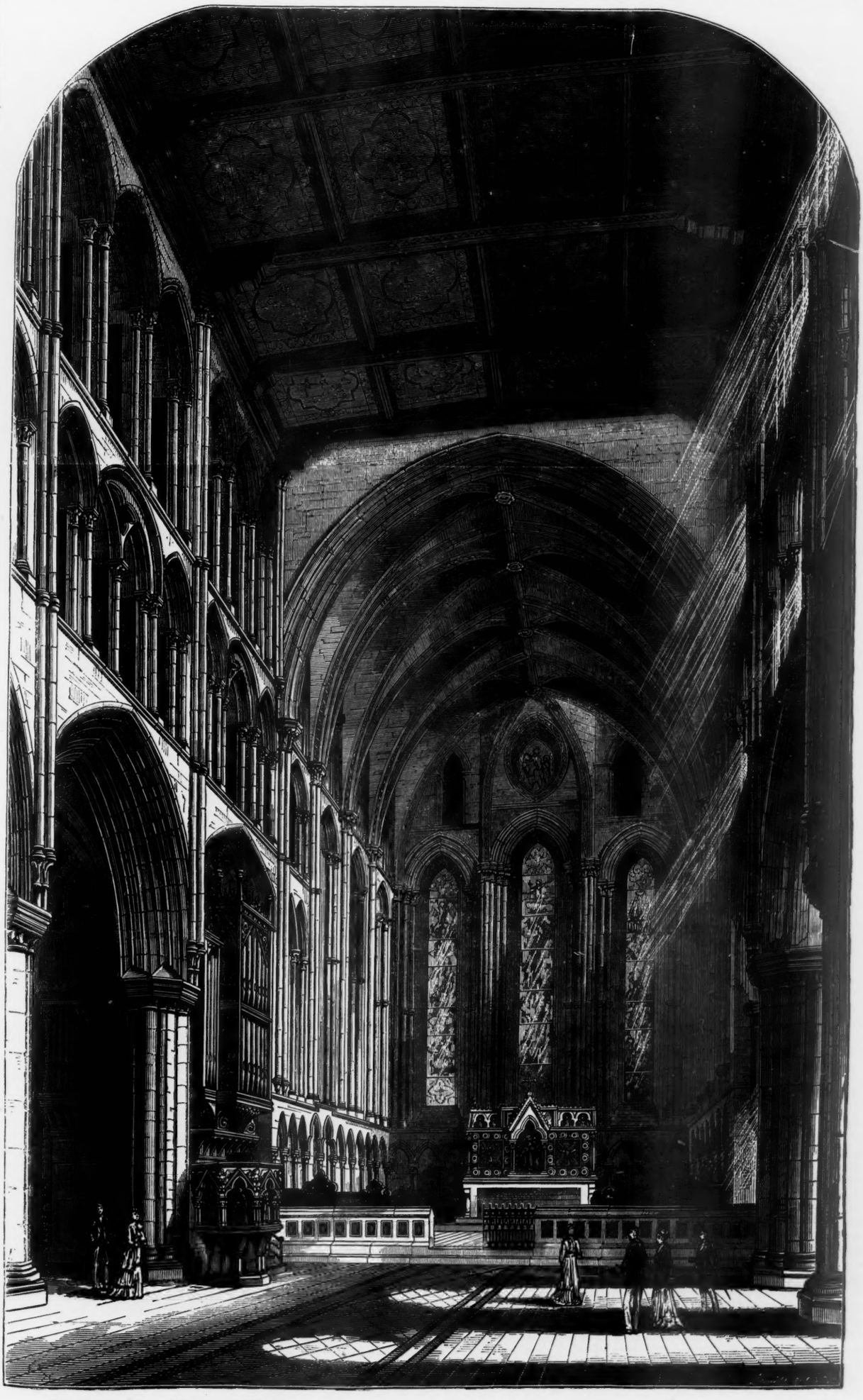

TYNEMOUTH ABBEY CHURCH.—As proposed to be Restored by the late Sir G. G. Scott, R.A.

persons differ from this view, I think that as the land on which the wall stands is wholly the property of the owner of A, the most that can be said is that the owner of B has acquired an easement over the wall to the extent to which it is used by him. The Act goes on to say,—"'Party-structure' shall include party-walls, and also partitions, arches, floors, and other structures separating buildings, stories, or rooms, which belong to different owners, or which are approached by distinct staircases or separate entrances from without."

The provisions, so far as they relate to party-walls, are of two classes; those which regulate the nature of the construction, and those which fix the rights and duties of the respective owners of a wall with respect to each other. Part II. of the Act, which relates to dangerous structures, has also an important bearing on party-walls.

The first class includes such things as have to be done under the supervision of the district surveyor. With respect to them much misapprehension exists, but when carefully studied they become tolerably clear. I only propose, therefore, to bring them together in a form convenient for discussion, and such as will form an introduction to the much more troublesome and difficult class of provisions which relate to building and adjoining owners.

By section 27 of the Act, every building must be separated from every adjoining building by two external walls or one party-wall; and under particular conditions of size and occupation, the other party structures above defined must be used.

By section 9, any "alteration, addition, or other work," which affects the construction of a party-wall is subject to the regulations of the Act; section 10 provides that whenever *more than* one-half of an old building has been taken down every part of the remainder of it that is not in conformity with the Act must be taken down; and section 11 provides that whenever *as much as* one-half of any timber or other partition not in conformity with the Act and separating old buildings is removed, the buildings must be divided from each other as directed by the Act.

The first schedule of the Act gives the thicknesses of "external and party walls" with reference to their lengths and heights, the height (for this purpose) being measured from the base of the wall to the level of the top of the topmost story; which means the underside of the tie of the roof, or half the vertical height of the rafters where there is no roof-tie. But the party-wall must, by section 17, be carried up above the roof flat or gutter of the highest building adjoining thereto, so that it shall be 15 in. above the flat or gutter, and 15 in. from the roof when measured at right angles to its slope. If any turret, dormer, lantern-light, or other combustible erection be upon the roof within 4 ft. of the party-wall, the wall must be carried up 12 in. above such erection, and be 12 in. wider on each side than it is. Also, the wall must be carried up above any part of a roof that is opposite to and within 4 ft. of such wall.

By section 13, recesses may be made in party-walls, but the backs of them must be 13 in. thick. They must be arched over, must not come within 1 ft. of an external wall, and must not extend over more than one-half the area of the party-wall.

Section 18 forbids that a chase cut in a party-wall should exceed 14 in. in width or 4½ in. in depth, or should leave less than 8½ in. of brickwork at its back, or should be within 7 ft. of any other chase on the same side of the wall.

By section 28, any opening made in a party-wall for the purpose of uniting two buildings, which together would contain over 216,000 cubic feet, must be not more than 7 ft. wide and 8 ft. high, and the floor, jambs, and head must be of brick, stone, or iron, and have two wrought-iron doors, each ¼ in. thick, separated by the full thickness of the wall, each fitted in rebated frames, without woodwork of any kind. Buildings so united must be in the same occupation, and when they cease to be so occupied the openings must be built up.

By section 20 the back of every chimney opening in a party-wall must be 8½ in. thick, from the level of the hearth, to 1 ft. above the mantel, and no chimney-breast or shaft built with or in a party-wall must be cut away without the certificate of the district surveyor.

Sections 24 and 25 fix the thickness of the party arches which have to be constructed to separate different properties.

As to timber in party-walls, by section 15 the ends of bressummers and of beams or joists, if bearing upon party-walls, must be 4½ in. from the centre. Bressummers must have stone or iron corbels under them, and must have 4½-in. piers or else story-posts under them, in addition to their bearing on the party-walls.

The foregoing regulations, which may be profitably studied at length by referring to the respective sections, will help to a right understanding of that part of the Act which deals specially with the rights, duties, and powers of the respective owners of party-structures. These are the subject of constant dispute, often leading to grave annoyance and loss; it is therefore highly important that from the first step everything relating to a party-wall should be conducted with careful reference to this part of the Act. But, in fact, this is very often neglected, the whole proceeding being carried on without regard to the law, or in reliance on the good nature of the respective parties, although, as neighbours, they are in a position of natural antagonism to each other. The following considerations will show that such a practice as this is unsafe, and ought not in any case to be followed.

Laws are made to be observed; not to be ignored. A client has a right to expect that when there is a well-known mode of procedure legally established, that mode shall be followed by his architect in every particular. Although he will give no special credit if everything goes well, he will have a right to complain if they go badly. There is always a risk that some complication will arise even in the simplest matter, especially if it is known that it is being loosely managed, for then either party may see his way to gain something by taking advantage of the want of strict arrangement. Even when all parties wish to be fair, it often happens that owners of property are so nervously anxious about it that they think every one who touches it is doing them mischief. Then the parties may quarrel during the progress of the work, or they may die, when their successors could be neither legally nor morally bound to adopt any arrangement not legally made. It very frequently happens that parties are only limited owners, being lessees or tenants for life, or they may be trustees for parties, who will hold them responsible for any damage to the property. If the owners are a public body, their officers will not be justified in allowing anything less than the strict fulfilment of all legal requirements. If any loss is caused through irregular proceedings, the architect or the builder may find himself saddled with the whole responsibility for damage caused in executing works which he had no more real authority to do than any man in the street. Lastly, it is generally quite as little trouble to do what the law requires as to manage the matter in any irregular way.

The owners of a party-wall are called "tenants-in-common" of the wall; they are not owners each of the half wall which stands on his ground. When there is no Building Act, either owner could pull down the whole if he thought he should like to have a better one. The only foundation in the Act for this idea of separate ownership seems to be in the interpretation of the word "area," which, as regards a building, is to include "such portions of the party-walls as belong to the building."

Party structures, considered as belonging to different owners, are dealt with in Part III., beginning with section 82, which enacts that such one of the owners of the premises separated by, *or adjoining to*, any party structure as is desirous of executing any work in respect of it, shall be called the building-owner, and the owner of the other premises shall be called the adjoining owner. Now "owner" (by the interpretation clause) applies to "every person in possession or receipt either of the whole or of any part of the rents or profits of any land or tenement, or in the occupation of such land or tenement other than as a tenant from year to year, or for any less term, or as a tenant at will."

At an early period, often before the old building is pulled down, the building-owner should cause a party-wall notice to be served on every adjoining owner, and as the work to be done may not as yet be finally settled, it is wise to include all the matters which a building owner can do in the notice. There is often great difficulty in finding out the real owners; a weekly tenant will represent himself as a leaseholder, or a *bond fide* leaseholder may have so short a term that he will be gone before the notice expires. As a rule, it is best to serve a notice on everybody who seems to have any interest in the property, for if they are not owners the notices will not make them owners. The notices usually bring all parties to some arrangement. If there is a leaseholder, he being responsible to his lessor, most usually and properly is the party solely dealt with, but the freeholder will sometimes insist on protecting himself also by an award.

The form of notice is printed and sold by authority of the Metropolitan Board of Works, and is usually filled up and served by the architect of the building-owner. I suppose it is intended that this ordinary matter may be properly managed without its being necessary to take legal advice and incur needless expenses. As it cannot be properly said to be the architect's business, he had better strictly limit himself to such cases as are quite plain and clear; and if there is the least doubt as to the proper parties on whom to serve notices (as there must often be in the case of trusteeships and of companies), he should let his client's solicitor take the responsibility. The same may be said when the clients are trustees or a company. The notice must be given to the adjoining owner three months before any works can be done by delivering the same to him personally, or by sending it by post in a registered letter at his last known place of abode. All other notices or requisitions must be served in the same way. The architect is usually named in the notice as the surveyor appointed by the building owner to superintend the work, and to settle on his behalf all matters of difference that may arise in relation thereto. This is convenient, but not necessary, for the building-owner is not bound to appoint a surveyor until he has received ten days' notice from the adjoining owner to do so.

It is very common to receive a party-wall notice signed by the architect on behalf of the building-owner, which is invalid, and if any difficulty arises his client may disown him. It is also common to name as "the surveyor" a firm of architects instead of that member of the firm who intends to act; in these cases the appointment is invalid.

We have nothing to do here with the motives which may often render it desirable for the building-owner to keep the exact nature of his intended operations secret as long as he can; such, for instance, as his possible interference with ancient lights. But, as a rule, it is only courteous to let the adjoining owner know, if he wishes it, as soon as possible what is to be done, for it may happen that some of the works included in the notice will so seriously interfere with his property that long notices and arrangement with other parties is necessary. I have had cases where the nature of the occupation of adjoining premises was such that it was found better to build a new external wall than to pull down and rebuild the party-wall.

If the adjoining owner does not within fourteen days express his consent to the notice, "he shall be considered to have dissented therefrom, and therefore a difference shall be deemed to have arisen" between the parties. It is as well that this difference (which is almost inevitable) should be allowed to arise thus, by lapse of time, rather than by writing a formal letter, which may convey the idea that serious obstruction is intended. After the lapse of this time the adjoining owner may appoint the surveyor who is to act on his behalf, but he is not bound to appoint him until ten days after he has had formal notice to do so, for the original party-wall notice does not ask him to appoint a surveyor, though many persons seem to think it does. If either party makes default in appointing his surveyor after this ten days' notice, the party giving the notice may make the appointment in the place of the party making default. The building and adjoining owners may concur in the appointment of the same surveyor, who, in that case, has the same power as the two surveyors and the third surveyor whom they are required to appoint. This appointment is very often neglected. A surveyor who desires to obstruct will try to avoid it. It is, however, the first business to be done between the two surveyors, whether they are going to agree amicably or not. He will naturally be some person whom both parties believe will act fairly and impartially if required. If either party refuses to join in the appointment of the third surveyor, there is nothing in this Act to compel him to do so; it is a matter for legal advice, but it is a very unusual course to take. On this point, I would remark that it

does not seem the duty of surveyors when placed in the position of arbitrators to exercise their ingenuity in placing obstructions in the way of the other side, as if they were solicitors instructed to fight a matter to the uttermost. They are appointed to see that the difference is fairly adjusted, and that is all that either side can honestly desire. The appointment of the third surveyor should be in writing, signed by both parties, although he may never be called upon in the matter. Indeed, I believe the Act is clear that he must at least be appointed, for the 7th clause of the 85th section says that the "one surveyor" (agreed on between the parties), "or three surveyors, or any two of them, shall settle any matter in dispute." So that they must be *two of three*, and not simply *two*. Observe also that the third surveyor is not an umpire, as is often imagined. He can only act with one or both of the others; and in cases of very great difficulty and responsibility he had better be joined with the other two for the security of all parties, and to show that every care had been taken to arrive at a proper decision. The duties of the surveyors are "to settle any matter in dispute between such building and adjoining owner, with power by his or their award to determine the right to do, and the time and manner of doing, any work, and generally any other matter arising out of or incidental to such difference." But they have no power to award that the work shall be begun before the expiration of three months from the date of service of the party-wall notice, which requires the permission of the adjoining owner himself. There is an appeal within fourteen days to the county court, which brings the matter into the hands of the lawyers, where we may very well leave it. The award must not deal with anything beyond the Act, and if in carrying it out injury is done to ancient lights of the adjoining owner, it will not protect the building-owner from the consequences thereof.

We find the rights of the building owner defined in the eighty-third section. The Master of the Rolls recently laid it down in a case in which I was engaged, that this section contains *all* his rights; and that, within the area affected by the Act, he has no others. The eighty-eighth section regulates the apportionment of the cost of works that may be done, and it will be convenient to read the two sections together.

1st. The building-owner may repair any party-structure that is defective or out of repair, and the cost in such case must be borne by the two owners in due proportion, regard being had to the use which each makes of the structure.

2nd. He may pull down and rebuild if it is so far defective, or out of repair, as to make this necessary or desirable, on the same terms as to the cost.

3rd. He may pull down any timber or other partition dividing the building that is not conformable to the Act, or to either of two older Building Acts which next preceded this Act, and build a proper party-wall instead, each owner bearing his due proportion of the cost according to the use he makes of the wall, and also to the thickness of wall which his building requires. 4. He may deal with intermixed property; and 5th, with buildings communicating over public ways, which will involve very complicated questions not relating to party-walls, and which may, therefore, be passed over here. 6th. He may raise any party structure permitted by the Act to be raised, or any external wall built against such party structure; but as this would be solely for his own convenience, he must bear the cost, and must, besides, make good all damages occasioned to the adjoining premises, or to the internal finishing and decorations, and carry up all flues and chimney-stacks of the adjoining owner, so far as the new works may render it necessary. 7th. He may pull down any party structure,—that is, of insufficient strength for his intended building, and may rebuild it of sufficient strength, on the like conditions as to cost and as to making good damage to adjoining premises, their internal finishing or decorations. 8th. He may cut into any party structure at his own cost, and on condition of making good damage to the adjoining premises. 9th. He may cut away any footing, chimney-breast, jambs, or flues projecting from the party-wall in order to build an external wall against it, or for any other purpose on the same condition as to payment of cost and damage. And although they, being upon his side of the wall, may be considered his own property, he cannot deal with them without a proper award under this Act, nor can he cut away the chimney-breasts or shafts without the certificate of the district surveyor, as already pointed out. And after the external wall has been built, the party-wall remains a party-wall, which may cause future trouble to either owner, or to both.

Finally, there is a very comprehensive clause giving the building owner a right to perform any other necessary works incident to the connexion of party-structure with the premises adjoining thereto.

It will be seen that there is very great scope for the exercise of the judgment of the surveyors on most of these points. There is the just apportionment of costs when work has to be done at the expense of both owners. Where the respective buildings differ greatly in size, and the party-wall which would be thick enough for one has to be built thicker in respect of the larger building, the exact position of the centre of the wall with respect to the line dividing the two properties may have to be fixed separately for each floor. As there are certain parts of the metropolis where the space in a building occupied by a thickness of only 4½ in., more or less, in a party-wall would be worth several hundreds of pounds, the importance of this arrangement is evident. Besides this, questions as to what damage has been done to the premises of the adjoining owner, his finishings and decorations, and the value thereof, are often very complicated. No power is given to make the building owner hoard up, or pay for hoarding up, the rooms of the adjoining owner that may be left open by pulling down the party-wall. No award, therefore, can deal with that particular item, whatever remedy might be found by action at law,—a not very promising proceeding. If the building owner fails to make good any damage done he is liable to a penalty not exceeding 20*l.* per day, at the discretion of the magistrate.

Although power is given above to raise a party-wall, no power is expressly given to *underpin* or to continue the wall downwards,—an operation frequently requiring to be done and included in a party-wall notice. I think we may draw a distinction between an ordinary act of underpinning, where such work is necessary by reason of the base of a wall being decayed or placed on a defective foundation, which act is of the nature of a repair, and the act of extending a wall downwards for the purpose of forming a basement of one or more stories in depth below the old foundation. The Master of the Rolls, in the case to which I have referred (Standard Bank *v.* Stokes*) had all this before him, and gave the opinion that the power given to *raise* a wall is wide enough to include this downward extension of it. He said, "Is it necessary to limit the word 'raise' to putting something on the wall on the top, and may not you raise or make it longer, or build it up by something on the bottom? I do not think it necessary so to hold." He considered, also, that having power by another sub-section of the Act to pull down a wall and put it up again, it would be an extraordinary reading of the Act to say that you may not do something less; that is to say, support it and put a new wall underneath it But the judge founded his decision on the power which is given "to perform any other necessary works incidental to the connexion of party-structure with the premises adjoining thereto. He said, "If you make the sub-basement, and you do not support the wall, it will fall down, and it is incident to its connexion, because, if it fell down its connexion could be terminated in a very summary manner." If one may presume to choose between these three reasons, I should say the last seems to be the best. As to the whole of the rights that are given to the building owner, the Act provides that he shall not exercise them in such manner, or at such time, as to cause unnecessary inconvenience to the adjoining owner, and we have already seen that the surveyors are to determine the time and manner.

The rights of the adjoining owner, as affecting the party structure, are as follow. He may require the erection thereon of certain chimney jambs, breasts, or flues, or certain piers or recesses, or any other like works for his own convenience, and the building owner must do this if it will not be injurious to him or cause unnecessary inconvenience or delay. The adjoining owner may require these works to be done by giving a notice, a printed form for which is provided, within one month after his receipt of the party-wall notice from the building owner, or he may do the works himself. If he gives a notice it must be done in the same way as laid down for the notice by the building owner, and if a difference arises thereon it must be dealt with by the surveyors. Sections 89, 90, and 93, give the mode of arranging the payments by the adjoining owner for works done on his requisition. He may demand from the building owner security for costs and compensation before the work is commenced, and the amount of the security is to be fixed by the judge of the county court in case of difference.

By section 92, the building owner is to stand possessed of the sole property in the party-structure until any contribution which may be due from the adjoining owner in respect of it is paid. This may seriously hamper the adjoining owner in dealing with his property, and may induce him to pay.

The party-wall considered as a "dangerous structure" very frequently comes under the notice of the district surveyor. Its connexion with the external walls is peculiarly liable to cause danger to a building. A case is now under my notice where the front walls of a whole terrace of three-story houses, some fifty years old, have to be taken down and rebuilt, mainly owing to the party-walls having been first erected, and the front walls afterwards built up against them without any bond whatever. I know of a case in which this process was reversed. A long façade was first erected, and afterwards the party-walls were built against it at such distances as suited the wishes of purchasers, good bond being, of course, impossible. New fronts have constantly been added to buildings, with very slight possibility of getting good bond to the ends of the party-walls, and even in the building of new premises, great difficulty is experienced in making the façades of two adjoining houses meet at the centre line of the party-wall, and at the same time getting good bond. Nevertheless, this ought to be done, for we very frequently meet with cases where the walls at this spot are cracked from top to bottom, and are very far from being safe.

In cases of rebuilding, where a party-wall, being exposed, is found to be unsound, it is the duty of the surveyors duly appointed to determine on the steps necessary to be taken in respect of it, and they ought to keep the responsibility from all other parties. Very frequently where work is being done irregularly, the building owner gives the adjoining owner notice that he will not be responsible for anything that may happen to the adjoining premises; but at least he must have some responsibility for the party-wall of which he is joint owner. If neither party will support it, it may result in accident before the attention of the district surveyor is called to it. On the other hand, a building owner who has neglected to give the proper notice in good time, and desires to rebuild a party-wall without waiting for the period of three months, is often anxious to get the wall condemned as a dangerous structure, which would operate unfairly to the adjoining owner. One who desires to build a new wall, and to make his neighbour pay half the cost, although the existing wall may be quite good enough for the latter, will also try to obtain the condemnation of the wall, often on very slight grounds.

I have now touched upon every part of the Metropolitan Building Act which relates to party-walls, except only certain matters of procedure which are rather in the department of the lawyers than in ours. Nevertheless, these portions may be very usefully studied, and the opinion of an experienced lawyer on any difficult case will usually throw great light on any part of the Act. My object has been to arrange the matter in a form to be easily understood, to point out those misapprehensions which seem most prevalent, and to notice some of the cases of difficulty which we meet in practice. I shall feel glad if those members who have had most experience in these matters will give us the advantage of it, and particularly if they will point out any matter which seems to have been insufficiently noticed, or which requires to be corrected, and I trust that the result will be useful to the members of this Association.

The President, in inviting discussion, said that Mr. Blashill had treated his subject in a singularly clear and lucid way, and had brought forward many points not always borne in mind, and perhaps not generally known by architects.

Mr. Robert Walker said he feared that there was not only a very great amount of ignorance,

* Reported in *Builder* for 1878, p. 207.

but a great lack of a due sense of responsibility in dealing with party-walls prevailing among architects and surveyors having to do with property in the heart of the metropolis. The expression "It is *only* a party-wall!" was too often used as an apology for tampering with party-structures. He met with a typical instance the other day. A large boiler was being fixed in some premises, and in order to gain a little more space, a portion of the party-wall was cut away so as to form a recess into which one end of the boiler fitted. When he called attention to this, he met with the rejoinder, "But it is only a party-wall!" Speaking generally, he felt convinced that dealings with party-walls were conducted in a sort of slipshod manner in many architects' offices. He felt deeply on the question, because a jury of his countrymen had taken upon themselves to censure him for allowing two eminent architects to do something in connexion with a party-wall which he had no power to prevent. It was often erroneously assumed by architects that they could do what they liked with the half of the party-wall adjoining the property in which they were interested; but it was not so, any more than that one of two men who were joint owners of an elephant could shoot his half of the animal. A party-wall consisted of two undivided moieties. The Building Act provided that a building-owner should not touch the chimney-breasts on his side of a party-wall without the certificate of the district surveyor. But it was an anomaly in the Act that it gave no power to the district surveyor to deal with the wall as a whole. The law officers of the Metropolitan Board of Works had supported him (Mr. Walker) in his opinion that, until the district surveyor was called upon to interfere under the Dangerous Structures Act, all the responsibility of dealing with a party-wall attached to the surveyors acting for the respective owners. The Building Act said most distinctly that each party should appoint a surveyor, unless they both agreed upon one surveyor to act for both owners; and in the event of each side appointing a surveyor, the two surveyors so appointed should nominate a third to act as an umpire, to whom all differences should be referred. Where the two surveyors appointed by the owners refused or neglected to appoint a third surveyor, a deadlock would very often ensue, and the only remedy was to go to the Court of Queen's Bench, and get a *mandamus*, or else to make an *ex parte* application to a judge in chambers for an order compelling compliance with the Act. If either of the owners did not comply with the Act, the best course was to bring the matter before the Metropolitan Board of Works, and to give the owner notice that he would be held responsible for any damage arising from his non-compliance with the law. The whole question of party-walls was deserving of the most careful study. Modern fronts were now carried up in crowded thoroughfares on nothing but iron and glass, and practically the party-wall was the only part of such buildings which had any vital energy and force in it. Good party-walls, in fact, formed the backbone, the sheet-anchor, of such buildings. It was terrifying to see how often heavy superstructures were carried up on iron columns, in conjunction with party-walls that were perhaps two or three hundred years old,—especially in these days of underground railways and heavy sewerage works. The architect would best study his own and his clients' interests by insisting upon thoroughly sound and unimpeachable party-walls.

Mr. Gilbert R. Redgrave said that Mr. Blashill had pointed out most carefully the way in which the two surveyors appointed by the respective owners were to nominate a third surveyor, who was not, according to Mr. Blashill, an "umpire," although Mr. Walker had spoken of him as such. The Act clearly said that the award as to a party-wall must be made by the *two* surveyors. Mr. Blashill had not stated whether a party-wall extended right through to the face of the frontage. Presuming it to do so, what duty was enforced upon the building-owner in case of the adjoining owner requiring particular materials carried up on the exterior?

Mr. J. Douglass Mathews said that every party-wall had its own peculiarities, and although in some cases they did not involve much trouble, in others a great number of questions arose which could only be settled as they occurred. Of course the broad principles to be observed were laid down by the Act. In all cases where party-walls were increased in height, all questions arising as to rights of light and air should be kept distinct from those arising as to the party-wall itself. One point which often caused a great deal of trouble was that the Building Act empowered a building-owner to do certain things in such a way and at such times as not to cause inconvenience to the adjoining owner. This was an open door for all sorts of difficulties, especially when there were three or four, or more, adjoining owners. Of course, it was an inconvenience at the best of times for the adjoining owner to have his rooms laid open by the pulling down of a party-wall, and it would be exceptionally inconvenient in the present cold season when the party-wall so demolished happened to contain the chimney-breasts of the adjoining owner's house, for, of course, it would preclude fires. The inconvenience attending the demolition and rebuilding of a party-wall was one, however, which the adjoining owner must put up with so long as he enjoyed the convenience and economy accruing from making one wall divide two properties. He had heard that it was likely that a case raising the question of compensation for such inconvenience would shortly come on for hearing, but it was to be hoped that it would not go against the building-owner. In the demolition of old party-walls it was necessary to exercise the utmost care, as sometimes the chimney-breasts were carried on either side of the wall in such a way as to make those on one side balance those on the other. He thought that, all things considered, the provisions of the Building Act as to party-walls were pretty clear and distinct.

Mr. S. F. Clarkson said that chimney-breasts built against party-walls, although they were bonded into party-walls, were not part thereof. The building-owner, or the person who wanted to deal with his side of the party-wall, must not do anything that would imperil the safety of the structure without notice, and the purpose of the notice was clearly that the adjoining owner should make provision for his own interests. But the Act should not be unduly strained, for although it was very properly not allowed to the building-owner to do anything to a party-wall that would endanger its stability or inconvenience the adjoining owner, nevertheless it was allowable to do a great deal of work upon a party-wall. The question of party fence-walls was becoming of increasing importance, and some day or other legislation would be called for to enable them to become party-structures. As Mr. Mathews had said, the Building Act was, in the main, a good Act, and it was much to be desired that country-towns and rural districts should be provided with equally satisfactory legislation, especially as to the rights of adjoining owners in party-walls, such rights being at present most dubious. Mr. Blashill had not mentioned that in London we were going to have practically some new building legislation, dealing with party-walls as well as with other matters. He should very much like to feel assured that that legislation (which would take the form of bye-laws prepared by the Metropolitan Board of Works in pursuance of powers given them by the Act of last session) would be effective without being too stringent. One of these bye-laws provided that party-walls might be constructed of *inferior* bricks! That provision, taken in conjunction with what Mr. Walker had said, was not very reassuring. Of course the provisions of these bye-laws as to foundations and materials generally would apply equally to party-walls and to external walls.

Mr. Hunter said that the Building Act stipulated that three months' notice should be given to the adjoining owner by the building owner of his intention to proceed to interfere with or pull down and rebuild a party-wall, but, so far as he could see (and he had taken legal advice), there was no power in the Act to compel him to proceed with the work at the expiration of the three months. Again, it appeared to be a moot point whether a party-wall which was carried up higher than one of the two properties which it served to separate was a party-wall for its whole height. On this point, it seemed to him that Mr. Blashill would have great difficulty in establishing the correctness of his reading of the Act.

Mr. Walker explained that he merely used the word "umpire," as applied to the third surveyor, in its colloquial sense. He wished to add that difficulties often arose where one party, having given notice to deal with a party-wall, went on at once without waiting for the expiration of the term. That could be stopped by an injunction in Chancery, on the ground of non-compliance with the Act. In the last Building Act for Bristol, a clause had been inserted to the effect that if the adjoining owners of a party-structure could not agree, the old structure should be pulled down, and each party build a new one!

The thanks of the meeting having been tendered to Mr. Blashill for his paper,

Mr. Blashill, in reply to Mr. Redgrave, said that most undoubtedly a party-wall extended right through to the surface of the frontage, or it would not completely separate the two buildings. In answer to Mr. Hunter, he said the Act contained no provision to compel a man who gave notice of his intention to do certain things to a party-wall to proceed with the work at the expiration of the three months.

THE GOLDEN MEAN.

FULL many a gem of truth has been kicked about through the ages, has been picked up and cast away again, without its value being recognised, till some mind with more penetration than usual has suspected a brilliant jewel below a rough and somewhat unpromising exterior. Of such crude and imperfectly revealed truths, often taken up and rejected without the least suspicion being entertained of their real value, Mr. Cave Thomas considers the Doctrine of the Mean, in which he recognises great scientific significance, and has devoted himself to the cutting, developing, and polishing of its various facets.* The Golden Mean is to him the keystone of the philosophy of the future, of a mathematical solution of the intellectual process, and of the moral law. He maintains that the *form* of our experience, of our cognition, is a quantitative or mathematical *form*, and that the selfsame principle which finds mathematical expression as the *mean* is the universal expression or measure in nature for the good and the beautiful. We propose, therefore, pending the publication of Mr. Thomas's work, to give a brief sketch of what he has been doing through the years towards expounding the Doctrine of the Golden Mean in reference to cosmical phenomena, to æsthetics, hygiene, education, ethics, politics, and natural theology.

Cosmical Phenomena.—In cosmical phenomena Mr. Thomas has shown that the preservation of the *mean* appears to be the very spirit and purpose of nature, and that although temporary aberrations may occur in the orbital movements of the planets, yet that these are periodically redressed; that there is a law of compensation obtaining throughout the solar system by which the *mean* through all the vicissitudes of that system is preserved. Thus, though the amount of light and heat may vary at different times and in different places throughout the year, yet that the mean annual amount of light and heat received from the sun is constant. The same principle obtains in reference, as we have stated, to the orbits of the planets. The author maintains that a great moral principle having a mathematical expression is supreme in the cosmos. For if the *mean* were not constant the *mean* solar day would not have remained unchanged, as it is known to have done, since the time of Hipparchus.

Æsthetics.—But Mr. Thomas not only contends that this principle holds good in the larger phenomena of the cosmos, but in human life, both intellectual and physical, and, in respect to the principle of beauty, that this, according to the law of probability, would inhere in the mean. Morecver, experience proves that the mean is the mathematical expression for the proportions of the beautiful; for if beauty did not lie in the mean it would inhere in some proportional relations, in which there would be excess and defect, which is absurd. When studying this subject some years ago, he predicted that this principle, as the principle of beauty, would be confirmed by experiment. His own suggestion may have fulfilled that purpose, but, at all events that has been accomplished, he thinks, by what has been denominated composite photography,—a process by which a number of faces are combined so as to form an average image of the features and faces combined, and in which the opposite disproportions in the faces of the several individuals photographed, neutralise each other, and present a typal form better looking than either. If this process could be extended, so as to use a sufficient number of individual instances, it would give us the ideal form or type of beauty,—the mind attains to

* The Golden Mean, or the Mathematical Theory of the Good and the Beautiful.

its ideal by a similar process of averaging. This method of composite photography was described in *Nature* by Mr. Douglas Galton. Our author carries the principle of the mean through in a logical manner in that section of his work which is devoted to æsthetics In his "Revised Theory of Light," &c., Hogarth, and Sir Joshua Reynolds, without recognising the great scientific import of the mean, had convinced themselves that it was the principle of beauty. Other writers upon art had previously recognised the mean as the golden principle of taste. Addison had indeed caught a glimpse of its universality, as may be gathered from the following quotation:—"There is," said he, "a mean, and a certain measure in which the good and the beautiful consist, and out of which they never can depart"; and Dufresnoy says:—"And taste, like morals, loves the golden mean." Mr. Thomas has not been content with a mere vague expression of the principle, but claims to have reduced the science of æsthetics to a mathematical calculus which brings the subject within the category of the exact sciences. The subject has grown under his hands, and what he has already published on the subject may be regarded as fragmentary and incomplete compared with what he promises to presently give us as his matured work.

Hygiene.—Our author may not find it so difficult, perhaps, to convince his readers of the truth of the principle he is expounding in respect to hygiene as in some other sections of his subject. For any violation of the law in the conduct of the human being is followed by tangible and disagreeable results, and its continued infringement leads to ill-health and disease. The virtue of moderation in living is known to most intelligent persons, though in many cases, unfortunately, they may honour the principle more in its breach than its observance simply because it is regarded as a haphazard and rule-of-thumb expression, instead of as it is the exact enunciation not only of a scientific but most important truth, and that they have not fully experienced the inevitable and dire consequences resulting from its repeated infringement. What Mr. Thomas may have to say on this portion of his subject may be of wide-spread advantage, and serve as a profitable source of reference both now and in the years to come.

Education he regards as a branch of the wider hygiene, and the infringement of the *mean* to be as injurious to the hygiene of the intellect as to that of the physique. He regards the principle as the basis of a science of education, of the education of the future, which will be established on training instead of "cramming," on a moderated use of all the intellectual faculties, and not upon a specialisation of one,—on a symmetrical training of the whole together, rather than on an abnormal development of a part. In a lecture which the author gave before the Society for the Development of the Science of Education, he formulated the fundamental principles of this science, and showed that these are resolvable into laws having reference to the distribution of brain power, which when enunciated are seen to be correlated with those abstract principles which regulate the distribution of force amongst the planets, and in which the preservation of the *mean* is also the central law. The *mean* would, indeed, seem to be to the moral system what the sun is to the solar,—the very centre of gravitation.

Ethics.—Ethics, too, may be regarded as a portion of the wider hygiene, for the science of ethics is a science of the moral hygiene, in which the principle of the golden mean equally holds good. But in this particular section Mr. Thomas had very little to do; he had no occasion to go on a voyage of discovery, for Aristotle had traversed that portion of the subject of old time. The exact basis on which Mr. Thomas builds his system will, however, remove obscurities that have crept into the Nichomachian ethics in the lapse of centuries. In other respects, this section was ready to his hands, and falls naturally into its place. It is, perhaps, right that persons who may not have studied Aristotle's ethics should be informed that these are founded on a quantitative or mathematical basis, in which the *mean* is recognised as the principle and measure of moral rectitude.

Politics.—The principle of the *mean* may be traced as holding good in politics. It may be recognised under several forms of expression,—as, for instance, the balance of power, the *juste au milieu*, compromise, &c. It is recognised, too, in that great axiom of political economy, viz., "the greatest happiness to the greatest number," which means nothing more nor less than that distribution which undoes excess, and would give to every man his due or *mean* of wealth and power. It is the principle which gives stability to a constitutional government,—that is to say, to a government in which the tendency of any component element of the State to monopolise political power is provided against, is frustrated, compensated, or neutralised, by the antagonistic action of its other elements, and thus a balance or *mean* is preserved amongst the various estates of the realm. The observance of the golden mean in politics, which constitutes the virtue of constitutional governments, will gradually be recognised as the principle which should also be observed amongst the nations in order to promote the general happiness; and a growing tendency towards moderation may be observed in the councils of nations, and to combine against any one which shall show a disposition to despotically assert herself against the common interests of mankind. Moderation amongst the nations would, in fact, be federation.

Natural Theology.—On this section of the subject the author must himself expatiate. It will here be sufficient to note that he traces the doctrine of the golden mean in Biblical ethics, not overlooking those remarkable expressions of the principle in the Gospels, that reiteration of the precept of the Grecian and Chinese sages,—observe the mean in all things,—which takes the form of "Let your moderation be known unto all men"; and also that grand summing of the experience of ages which recognises the grand principle in the aphorism,—"He that striveth for the mastery is temperate in all things." He also points out how consistent the Scriptural enunciation of the Messianic manhood is with the golden principle, the golden mean of rectitude and beauty.

ST. ALBAN'S ABBEY.

THE NAVE ROOF.

SIR,—The roof controversy seems now to be in a fair way for settlement. It has been well argued on all sides before the general body of the public,—the ultimate court of appeal in all such cases,—and the decision, of course, rests with them. The Faculty Committee may propose a policy, but they will surely not be so unwise as to persist in it when the vote is necessarily against them. At the meeting of the subscribers on the 10th of August, 1878, the follow resolution was passed:—"That the roof of the nave having become ruinous, it is desirable to restore it to the original pitch indicated by the weathering on the tower, keeping so much of the painted and panelled ceiling as is in a sound condition, and restoring the rest in a similar style." It has been proved that the roof *is not ruinous*, and the Faculty Committee have actually determined to keep it up under another roof. But it is now also proved to everybody's satisfaction that the roof-line which it is intended to follow for the new lofty roof is a fresh roof-line,—never used in the building before. It is not *the original pitch indicated by the weathering of the tower* mentioned in the resolution of the 10th of August. There is no *weathering* on the west face of the tower; but that is, of course, merely a slip due to ignorance of technical terms. The only line showing *the original pitch* (the line A B—C D on Mr. Neale's careful drawing given in last week's *Builder*) cannot be followed without destroying all the old parapets as well as the new parapets over the Early English bays erected by Sir G. G. Scott.

Therefore, the controversy is, as I have said, in a fair way for settlement. The faculty committee must either determine to do whatever they like, not heeding the history of the building, or they must give up their projected lofty roof. I sincerely trust they will see their way to giving it up. No one need regard the result as a personal victory; the only people who have been perfectly free from blundering are those who have never taken part in the controversy. But the importance of the precedent, if the wrong action is taken, cannot be exaggerated. Sir E. Beckett is, perhaps, rightly looked upon as the main promoter of the novelty. It may, therefore, not be inopportune to repeat his language at the Institute on the 11th of June, 1877,—"Notwithstanding the general avowal of conservative principles in restoration, a vast quantity of old work is much too frequently replaced by something entirely different from whatever was or could have been there before, and with no excuse except fancy." Such a confession of the errors of others ought not to be followed by indulgence in the same offence.

Let me take this opportunity of saying a word with respect to that "energetic body of men, organised for the very purpose of the conservation of ancient remains, who have left the battle of conservation to be fought out by others"; who are vigorously reproved by Mr. W. White, F.S.A., in the *Builder* of January 11th, p. 54. The members of the Society for the Protection of Ancient Monuments should not, I think, be blamed because they have not failed to perceive that the heads of the architectural profession, Mr. Street, Mr. White, Mr. Blomfield, Mr. Christian, the *Builder*, and the President of the R.I.B.A., have been right in the main; and that there is really no opposition to them which can be called serious. However, if Mr. White or any one else will point out where interference is now necessary, I will answer for it that time and energy shall be spent in the good cause.

JOHN HEBB.

SIR,—Since my last rather lengthy communication was written, Mr. J. O. Scott's section and Mr. Neale's section have appeared. Until the latter came out we were still practically in the dark as to the lines which Mr. Scott had really laid down, whether of the supposed old roofs, or of the proposed new one. And although he has shown Mr. Scott to be wrong in his conclusions, it is some satisfaction to find, after all that has passed, that Mr. Scott's lines were not impracticable and unreasonable, as from his sections and previous explanations they appeared to be. That section was manifestly an impossible one, and must have been, from some cause or other, quite incorrectly given, the top of the original Norman wall, as indicated, being shown 18 in. *below* the bottom of corbel-table, whilst the supposed line of the original Norman roof would intersect the face-line of the wall at 1 ft. 6 in. or 2 ft. *above* it; and, on the contrary, the supposed *lowered* roof would correspond very nearly with the line at D in Mr. Scott's section. Mr. Neale, however, shows that Mr. Scott's line really started from the top of the corbel-table, where Mr. Street and myself had placed it in our sections exhibited at the Society of Antiquaries, only that Mr. Scott placed the apex of his later, lowered roof at the point indicated by H (see *Builder*, p. 69), which had correctly been fixed on as the apex of the original roof, and which Mr. Neale finds conclusively to be so. Whether Mr. Scott's radically new line be carried or not, he will at any rate not regret now that the investigation made primarily at the instigation of the Society of Antiquaries has resulted in Mr. Neale's masterly production, which has placed on record the architectural evidences of the case in such a clear and simple manner.

WILLIAM WHITE, F.S.A.

SIR,—When I read my paper on St. Alban's before the Society of Antiquaries, on the 28th of November last, I exhibited a rough drawing to show my views both as to the pitch of the original roof of the nave, and also as to its design. Messrs. G. G. Scott & J. O. Scott, the architects of St. Alban's, forthwith made a drawing in order to show how inaccurate I had been. Mr. J. O. Scott at the same time prepared a report in answer to me, which was read at a meeting of the St. Alban's Architectural Society on the 17th of December, with a prefatory remark from the Rector, as chairman, that it had "had considerable influence over the decision of the Faculty Committee in the course they had adopted with regard to the roof of the nave." It contradicted very positively the arguments which I had adduced, and was based on what was asserted to be an accurate measurement as contrasted with my hasty conclusions and incorrect drawing.

In that report I find the following statement made by Mr. J. O. Scott, to which I wish now to call particular attention. He says "Doubtless if Mr. Street is right in his conclusions the only reasonable course open to the committee would be to abandon the proposed high-pitched roof," the alternative being "a bold act of destructive restoration," in which "I for one could never consent to take part." My conclusion was that there never had been a steep-pitched roof, with parapets, on the nave of St. Alban's, and that Mr. Scott's scheme would give us something the like of which had never before existed there.

As long as Mr. Scott's impeachment of my accuracy could not be answered, I felt it to be impossible to hint at any possibility of inaccuracy on his part. But the careful drawing which Mr. Neale has made and published of the west wall of the tower is drawn in so minute a fashion that it is well-nigh impossible that it can be seriously incorrect in any single particular; and as it proves that my drawing was a singularly exact one, being nowhere more than about 3 in. out of the real line, there can be but one conclusion, I should suppose, as to the necessary results. Mr. Scott's own drawing of the roof-lines has none of the evidences of careful examination and detail of the old roof-line which Mr. Neale's shows; and, indeed, it absolutely ignores, as if they did not exist, the most important marks that remain.

If there is still any disposition on Mr. Scott's part to contest my own and Mr. Neale's accuracy, I would suggest that the best plan would be to exhibit for a short time at the Society of Antiquaries Mr. Neale's drawing, Messrs. Scott's drawing, and a large photograph, made for the purpose, of the wall itself. The facts will then be clear and indisputable; and Mr. J. O. Scott has already announced what his conclusion will be if they prove me to be right.

GEORGE EDMUND STREET.

SIR,—I had not intended to go any further into this controversy, the matter being now settled, nor do I propose to do so; but my attention having been directed to Mr. Neale's diagram in your last issue, I trouble you with these few lines. I gather that he considers his recent measurements throw doubt on the accuracy of the lower line of roof, which I hold to be probably an Early Decorated one, and which is now being followed in the preparation of the new roof. I have only to say that I believe the precise measurement of several hundred broken bricks in the most rugged of old walls to be a task beyond even Mr. Neale's power, especially when done with the thermometer well below freezing; and that, under any circumstances, I have far more confidence in my own method of investigation, in which your readers will, therefore, not wonder at my continuing to place full reliance.

J. OLDRID SCOTT.

THE CHOIR CEILING AND THE TOWER WINDOWS.

SIR,—I am afraid "E. L. G." (p. 70, *ante*) has not been at St. Alban's lately, and has not followed very closely the events of the last few years. The paintings on the Choir Ceiling, which are now visible, were discovered in 1875, when the distemper was cleaned off. The woodwork was not altered. There have always been sixty-six panels, arranged in eleven rows of six panels each, since the fourteenth century; and, so far as I know, Mr. Neale has never stated anything else. This must be a mare's nest of the most perfect kind. The best description of the paintings is that by Mr. R. R. Lloyd, read before the St. Alban's Architectural Society, and given a little shortened in the *Builder*, March 14, 1876, p. 214.

As to the lower windows in the tower, "E. L. G." will not, I think, wish to persevere in his statement that "nothing but the arch-heads is even so old as the present century." He will of course have perceived by the drawing, given on p. 69 of your last number, how little bearing this has on the practical question at present in debate; and as he is always intelligent and candid, a very short method will be properly appreciated. He should look again at the east side of the tower in John Coney's drawing (Ellis's "Dugdale," 1819, vol. ii.). There the circular windows are shown, but the jambs of the present windows are shown also. J. Carter in preparing the (1810) plates of his monograph no doubt saw exactly the state of the case, and cleared away the ringing-floor, and opened out the windows on his drawings. The text was edited by Sir Henry Englefield from Gough's notes; it is not by Carter. These changes were not really effected till Mr. Cottingham took the building in hand. "E. L. G.'s" doubts are so natural, and yet the way everything came about is really so clear when it is explained, that I should have felt a pleasure in running through the illustrators,—from Daniel King in the early "Dugdale," who shows the windows as they stand at present,—onward to the thirties of the present century. Perhaps when the Faculty Committee have brought peace by determining to repair the present nave-roof, and then to let it alone, you may afford space for such a bit of peaceful archæology. Let it, however, be understood that the present lower windows in the tower represent the original windows.

S. FLINT CLARKSON.

THE INSTITUTION OF MECHANICAL ENGINEERS AND THE COST OF RAILWAY TRAFFIC.

AT the anniversary meeting of the Institution of Mechanical Engineers, on the 17th of January, a paper by Mr. Price Williams, on "The Economy of Railway Working," was read. Mr. Williams's paper was intended as a reply to a paper by Mr. Conder, "On the Cost of Working different Descriptions of Railway Traffic," which was read and discussed before the meeting of the same Institution in April last.* The paper commenced by remarking on the difficulty of arriving at the exact cost of any particular branch of the business carried on by the railway companies,—a difficulty which is increased by the absence in the "half-yearly reports of any detailed information to enable the working expenses of the passenger, goods, and mineral traffic to be separately determined." It would, however, be possible to ascertain their cost if the accounts were kept in the same manner in which the locomotive engineers of one of our earliest railways furnished them many years ago.

As to maintenance of way, Mr. Williams compared the wear of the rails at the Bolton station of the Great Northern and Lancashire and Yorkshire Railways with that on a falling gradient of 1 in 200 on the Great Northern, to support the position that heavy traffic at a slow speed is less damaging to the permanent way than heavy traffic at a high speed. He expressed the opinion that the product of speed into tonnage, or what may be called the measurement, by "speed tons," gives the measure of the cost of maintenance. Thus he argued that "the effect of what the passenger train loses in weight is compensated in speed"; and on this assumption he apportioned this part of the cost to the different kinds of traffic. He added, at some length, valuable information as to the relative wear of iron and of steel rails.

As to locomotive expenses, Mr. Williams admitted that the cost of wages was in the inverse ratio of speed. Assuming the mean speed of the London and North-Western, and of the Great Northern, trains to be thirty-five miles an hour for passenger trains, and twenty miles an hour for goods and mineral trains, the respective cost of wages was about 33·3 per cent. per mile for the former, and 66·6 per cent. of the latter train mileage. As to cost of fuel, actual accounts showed the consumption of 31·77 per mile on the London and North-Western, and 38·36 per mile on the Great Northern, per passenger engine, and of 68·23 per mile on the former, and 61·64 per mile on the latter, for goods engines. The extra cost of shunting on the goods traffic is, however, very great. On the Lancashire and Yorkshire railway it amounts to 120 per cent on the total goods train mileage.

Other items of running expenses have been apportioned by Mr. Williams according to the train mileage. Traffic expenses he has distributed according to the ratio of receipts. On these assumptions Mr. Williams has drawn up a series of tables of the operation of twelve principal lines of mixed traffic north of the Thames. The result of this mode of dealing with the figures is the estimated cost of 2s. 7·73d. per passenger train mile, and 3s. 2·82d. per goods and mineral train mile, the respective earnings being 4·60s. per mile for the former, and 6·24s. per mile for the latter. The cost of the mineral trains, however, including the return of the empties, is given in the table at 6s. 5·64d. per mile.

A note upon Mr. Williams's paper was read by the Secretary of the Institution from Mr. Conder, who was prevented by indisposition from being present at the meeting. This paper expressed satisfaction at the progress that had been made in the inquiry as to cost, and hoped that the investigation would not be allowed to drop until the full assent of scientific men, abroad as well as at home, should be obtained as to the results. Mr. Conder pointed out that in those points as to which he was at issue with Mr. Williams, the detailed statistics, and the scientific investigation of foreign engineers, were in accordance with his own view, while the distribution of cost now proposed was matter of opinion only.

The division of all railway costs into three main groups, of which the first is regulated by the character of the line, the second by the volume of traffic, and the third by the time occupied in the transmission of that volume, was in accordance with all the facts cited by Mr. Williams. If this great principle is once admitted, difficulties become matters of detail, and a final conclusion must be obtained.

Mr. Conder contested the propriety of the use of the expression "speed ton," as being entirely imaginary, and contrary to the mechanical law that friction depends on weight, without reference to speed. The only investigations directly made on that point are those of Herr von Szabo, laid before the Hungarian Academy of Sciences. From an examination of the accounts of a large number of railways this gentleman arrived at the law that "the speed of trains has no perceptible influence on the cost of the way." The cases of damage cited by Mr. Williams were attributable, as had before been mentioned by Mr. Markham, of the Midland Railway, to the use of brakes, which is always destructive.

Considering that the cost of maintenance was in direct proportion to gross tonnage, Mr. Conder agreed that the cost of wages is inversely as the speed. He pointed out that the assumed rate of twenty miles per hour was far too high for the mineral traffic; and that twelve miles, and on some lines as low a speed as five miles per hour, was as much as was made by the mineral trains between termini. These corrections would, if the ton mileage could be ascertained, bring out results in accordance with those previously intimated by Mr. Conder. Mr. Williams's distribution was entirely inconsistent with the fact that while the earning power of the great mineral carrying trunk lines is steadily diminishing, year after year, the earning power of those great passenger lines which run but a very few mineral trains, is with equal steadiness on the increase.

The subject is one of primary importance, and we trust it will not be allowed to drop until definite results are attained, and the outcome of Continental and American experience is shown to be in harmony with that of the working the railways of the United Kingdom. And it will be essential to the admission of any mode of distribution of cost that it shall explain the great commercial question of the advance or decline in the net earning power of capital.

* See *Builder*, vol. xxxvi., pp. 409, 626; and p. 9, *ante*.

KILLINGWORTH COLLIERY.

LONG known as the metropolis of one of our oldest and our most productive coalfields, Newcastle-on-Tyne has wide repute for its connexion with the commencement and the development of the railway system, and with that of the engines which it has called into use; but it is far from generally known that near it there is an isolated spot which might fairly be called classic ground in Pitland. It is a place which seems in no way distinguished from its neighbours, and the traveller by the East Coast route to Scotland, seeing its rows of low cottages, its mine-mouth machinery hiding behind a pit-heap of dark, slaty, and reddish shale, might fairly deem it undistinguishable from the scores of colliery villages passed in the journey north from Newcastle. But with it are inseparably associated the names of Stephenson and Wood, and it has been the scene of many of the experiments the results of which are now fully known. Before George Stephenson had won the rest of Tapton by his labours on the Liverpool and Manchester Railway, before even its precursor, the old Stockton and Darlington line, had been opened, before the first railway engineering works had been built, the great Northumbrian had acquired no mean fame at Killingworth. To it he had been "promoted" from "braking" engines at Willington Quay to braking the winding-engines there. At Killingworth he drained one of the pits of great feeders of water; there he experimented with his safety-lamp, and produced the "Geordie," which yet retains its hold on the affections of the northern miners, and there he produced those early locomotives which did good service in paving the way for "Locomotion" and the "Rocket." It was in 1814 that the first locomotive engine, freed from

the trammels of racks, toothed rails, transversely grooved wheels, and other of the expedients by which the early engineers sought to aid in the propulsion, was built. It was only a year or so after Stephenson had become "established as engineer to the partnership collieries" that this first engine of his was produced; whilst his two patents date from the years 1816 and 1817; and from only a year or two later the railway system and the construction on a large scale of locomotives spring.

Killingworth, which holds, then, so honourable a place in both the history of the railway system and in that of the provision of greater safety for the coal-miner, is a village less than half a dozen miles from Newcastle, and not particularly distinguishable from the many passed in the journey through the Northumbrian coalfield.

Killingworth itself is a quaint old village, scattered on a hill-side. It boasts a new church, flanked by a squat little Wesleyan chapel, and, hidden away up the lane, one for another denomination of Methodists. It has the usual two public-houses, one claiming kinship by title with agriculture, and the other owning fealty in name to the village. At its upper end there is testimony to the prevailing trade of the district, both in the past and in the present, in a coal-pit, now disused, whilst the old "gin," with its stout rope yet wound, tells the tale of the modes of ascent and descent in Stephenson's early days, and a brick-embedded boiler bears witness to the excellence of the work of the Towards, who, years ago, were boiler-builders on the Tyne. Passing away from this old pit down through the village street, where cottages, with tiled roofs, castellated fronts, and with the stereotyped internal arrangements of colliery dwellings, contrast with more pretentious buildings, a few minutes' walk brings us down to West Moor pit, that at which Stephenson wrought. It is in many respects unchanged since the days of the great engineer. The pit-yard, with its engine-sheds, its rows of old tubs, of fly-wheels, and of heaps of scrap-iron; the low rows of cottages, stereotyped in ugliness, with their ruddy doors and window-shutters; the great water-butts at each house; the wooden steps, pipe-clayed or sanded over; the footpaths, made only by the frequent footsteps on the roadway; and the hollowed barrows for the barrels in which drinking-water is brought from distant wells,—these are unchanged in the scores of years; but the old gin near the pit-shaft is disused, and its beams are rotting, though the strong rope, still covered, retains its strength of old. Recent sanitary legislation has made some change in the appearance of the pit-rows, and the prosperous times of a few years ago have left their traces in the better furnishing of many of the houses, though there is adherence to the common style of the pit cottages in the great fole-pole bedstead, the polishing chairs, the corner-cupboard, and the rosewood-cased clock, as invariably to be seen as the numbered door or the huge fire. In the pit-yard we have passed there is a token of Stephenson, in one of the engines of the olden type, which tradition assigns to him as the builder. Whether it is so or not, the ancient locomotive, with its four wheels, its cylinders on the top of the boiler, its foot-board along the side, and the open machinery, flinging huge and apparently unwieldy arms about as it moves, all tell of the olden days and of makers whose implements were few; whilst its new chimney, with the "spark-dasher" at its back, tell of the renewals that have been needed. Other tokens of Stephenson's presence are to be found near; for his house, little altered, is shown near. Passing the great pit heap, we have in front a pleasant stone-built cottage, rose-bushes and fruit-trees hiding its ancient walls, whilst above the lintel of the door is a sun-dial with the tell-tale inscription above it of "Aug. 11, MDCCCXVI." Three new dormer windows have been introduced into the front, and thus the spouting is changed, but otherwise the cottage, with its slip of garden in front, where geraniums bloom, and creeping-plants overrun the border, might be still the dwelling-place of the great engineer in the days when his mind was overcoming the difficulties of the safety-lamp, and the larger difficulties of coal tramways and "Puffing Billies." Straight in front of this memento is the main line north of that great railway which has swallowed up the primal line that Stephenson first surveyed; the old cast-iron rails first introduced have given place to longer and heavier ones of malleable iron, and these are now being replaced by steel rails. The ancient engines, such as we have seen, costing their 500*l.*, have been followed by others many times their power, size, weight, and price; the works such as George Stephenson projected on his first line, the Stockton and Darlington, are dwarfed in contrast with those of later date; but though the "Flying Scotchman" rushes past Killingworth at the rate of a mile in the minute, and though it and the system it traverses have little in keeping now with the engines that dragged their cast-wheels over jerking 3-ft. rails at a pace of five miles per hour, yet the latter is the progenitor of that great system, and Killingworth and its great resident of old have full claim to parentage, and to a share in

> "All the pomp that fills
> The circuit of the summer hills."

As the "Rocket" was the parent of our present locomotives, so those of the Killingworth class were the forerunners of the Rocket, bridging the gulf between it and Trevethick's early engine; and thus making possible the commencement of the railway system.

THE MOST RECENT TORPEDO BOATS, AND THEIR INFLUENCE ON MARINE ARCHITECTURE.

We have received from New York full accounts of Capt. Ericsson's new torpedo vessel, the *Destroyer*. The subject is one of unusual interest to this country, as it tends to throw light on the question how far it is desirable to entrust the maintenance of our maritime supremacy, or the defence of our coasts, to those enormous ironclads, of which the number is so closely limited by the cost; and how essential it is to keep alive to what may be effected in war by small vessels of great speed.

The Secretary to the Navy says:—"Captain Ericsson has constructed a partially submerged and armoured vessel intended for greater speed than any ironclad, and capable of projecting a submarine shell with great velocity and accuracy to a distance of 300 or 400 yards, which is probably as far as any torpedo is likely to be effective at sea. Some preliminary trials have been made by the inventor; and a Board has been ordered by the Department, at his request, for an official trial when it is ready for service. If the practicability of all or any of these experiments should be established, our monitors and torpedo boats would furnish the amplest protection to all our harbours against any possible enemy, no matter what the size of the attacking ships. And inasmuch as we have been the pioneers in this mode of naval warfare, and have produced most satisfactory results from our experiments heretofore, the Department cannot withhold the expression of the hope that Congress will deal liberally with this branch of the service. . . . . The torpedo has become absolutely essential to the effectiveness of any modern system of naval warfare."

The U.S. *Army and Navy Journal* gives an account of the experiment above referred to by the Secretary to the Navy. The little vessel is built of steel, on lines as fine as those of a "'Varsity Eight," which the hull to some extent resembles. A flat deck rises but a few inches above the water, and an engine-room rising some 7 ft. above the deck, and occupying rather more than half the length of the vessel, with a chimney some 12 ft. high, is all that can catch the eye at a distance. In the bow of the vessel, a little above the level of the kelson, a horizontal tube, looking like a cigar-holder, with a door lifting upwards, contains the torpedo. At the stern is the propeller, a four-bladed screw; the rudder sets out from the stern behind the screw. The torpedo is not cast loose, like the Whitehead fish torpedo. Its connexion with the boat is maintained by a hollow rope, through which highly compressed air is forced by powerful pumps. The escape of this air turns the screws of the torpedo itself, which is said thus to attain a velocity of fifty miles per hour. During the whole of its brief transit it is capable of being steered from the boat by an ingenious manipulation of the movements of the air-pumps.

The editor of the *Journal* remarks on the steadiness of the little vessel at the speed of four minutes for a measured mile with, and four minutes eleven seconds against, the current. "She rode her keel so evenly and steadily that a tumbler of water might have been carried on her decks without spilling the contents. A little more motion was shown when the vessel moved astern. The steering apparatus is so perfect that a boy might handle the *Destroyer*. As to the ventilation, we confess to having had some scepticism concerning what was told us, but the report was not exaggerated. The little engine-room, so crowded with machinery that scarcely 10 ft. of standing-room was left between the engine and the boilers, was so cool that a winter over-coat was found to be a very comfortable addition to one's clothing, while standing within 3 ft. of the open and glowing furnaces. A small gale of wind was blowing down the hatches, the air drawn down through the ventilator at the stern finding its exit then. From this it will be seen how perfect is the control over the combustion in the boiler furnace. The engines are as compact a mass of powerful machinery as we could wish to see; and the extent to which power has been combined with economy of space is really marvellous, the amount of space occupied by three powerful engines being less than 300 cubic feet."

Captain Ericsson's report to the Chief of the Bureau, at New York, states that "the new screw of the *Destroyer*, 9 ft. in diameter, 14 ft. pitch, was tested last Saturday on the Hudson. 66 lb. pressure of steam being admitted to the engine developed 111 turns, or 17⅞ miles progressive speed of the propeller, per hour; crank-pins and journals perfectly free from heating. This result establishes the success of the vessel in point of speed, as the working pressure, easily maintained, exceeds 100 lb. per square inch, with 120 lb. steam in the boilers. Full admission of steam during the trial having been prevented by violent foaming, expedients are now being applied to check the same. Three days later Capt. Ericsson wrote,—"The foaming of the boiler of the *Destroyer* has been completely checked. During a trial on the Hudson yesterday the propeller revolved at the rate of 121 turns per minute, with a pressure of 87 lb. The pitch being 14 ft., this shows a progressive motion of 19¼ miles per hour. It will thus be seen that the power of the engine has not yet been fully utilised. I have accordingly ordered a new propeller which will be applied forthwith."

"To John Ericsson," according to the competent testimony of our contemporary the *Mechanics' Magazine*, belongs "the undivided honour of having built the first practical screw steamer, the first screw war-ship, and the first cupola vessel." As he has thus originated that race of leviathans which for a time have dominated the modern seas, so has he made the most remarkable advance in the structure of that craft which bids fair to be to the ironclad as the sword-fish is to the whale, or the ichneumon to the crocodile. It is, of course, premature to pronounce on the success of any such new craft until it is tested in actual warfare. But it is very clear that for the price of one *Thunderer* might be built sixty or seventy *Destroyers*; and that for defensive coast warfare there can be little question which outlay of the money would be most advantageous. The chance of effectively bringing a 38-ton gun to bear on one of these little craft, with only 12-ft. beam, sitting so low in the water that at a little distance the sea seems to cover the deck, would be small. But if the assailants were not one, but a dozen *Destroyers*, each bearing certain destruction to the big ship if she once laid her torpedo alongside her, what would be the chance of the latter? If war is finally to be put an end to by making the weapons of war so destructive that no one can hope to come alive out of action, no man can claim to have done more than Capt. Ericsson to hasten that martial millennium.

GREAT GRIMSBY.

A Fisher Lads' Institute is about to be built here, on land given by Colonel Tomline. It will provide a much-needed want for the numerous boys engaged in the fishing trade, who now have no place to resort to when on shore. The new premises will provide a large swimming-bath, lecture-hall, coffee-room, library, recreation-rooms, with agent's residence, &c. Mr. Charles Bell, of London and Grimsby, is the architect, and the works are to be begun at once. The estimated outlay is 3,000*l.*

A new school is about to be built by the School Board, for 750 children, in the West Marsh district. It will be the second provided by the Board, a former one for 1,100 children having been built eighteen months ago. The new school is from the designs of the Board's architect, Mr. Charles Bell.

SEAHAM HARBOUR.

WHEN Ulysses saw "Ithaca's emerging hills arise," with a "town and spacious port," his feelings could not have been stranger at the contrast to the Cimmerean gloom he had so lately left than would be that of one of the dwellers only a century ago on the northern coast if, on returning, he saw the spacious port of Seaham Harbour on the shores that less than threescore years ago were sand-blown banks. The third Marquis of Londonderry conceived and carried out the idea of such a port, and his successors chiefly have developed the town that has arisen. By marriage with the only daughter of Sir Harry Vane-Tempest, Lord Londonderry acquired large estates in Durham, including valuable coal-mines, and a nearer port than Sunderland being needed for shipment, Seaham Harbour arose. The foundation-stones were laid on the 28th of November, 1828, by the Marquis and his son, and the design of the Rennies, Telfords, and Buddles has been since carried out, the harbour and docks being hewn out of the limestone rock. On Monday, July 25th, 1831, a brig named the *Lord Seaham* sailed out of the port, and from that date for some years great growth was known. When the first reliable record was issued after its formation, Seaham shipped yearly some 86,000 chaldrons of coal; its branches of colliery railways yielded considerable traffic; whilst many of the essentials of town life were being supplied. It boasted of some ten public-houses; the "Royal Pilot" left daily the Lord Seaham Inn northward; whilst "gigs" and carriers supplied, in addition, the wants of the travellers and of those who sent traffic. The town was small, but the population was large in comparison with that it had been even at the census of 1831, when in the parish there were only 264 inhabitants, and when there was no place of worship other than the parish church of St. Mary. In these old days of Seaham it depended upon Houghton-le-Spring for its postal facilities (letters being received by "foot-post"), and for many of its commodities the village,—for it was nothing more,—was dependent upon Sunderland.

In the years that have passed, there has been a growth of the then little harbour of Seaham and its dependent village. Lord Londonderry was once credited with the remark that he intended to make "the grass grow in Sunderland streets," but whether or not it was made, it has not come to pass. Indeed, for some considerable period there was a stoppage of the growth of Seaham, the sailing vessels which plied thereto proved inadequate to meet the needs of the trade, and it is only within the last seven or eight years that there has been a recognition of the newer condition of trade, and an attempt to meet it, and a growth since. Since the screw-collier began at first to aid the sailing vessels and then to supplant them, there has been a marked growth in the coal trade from the little port. The shipments from the collieries of Lord Londonderry have risen from 274,000 tons to 366,000 tons, and though there is a falling off in the quantities from other collieries, the total has kept up to its half-million tons. Over the Londonderry railway 969,342 tons of coal were carried in the latest year we have official returns for, as well as 308,666 passengers. Eighteen steamers are chartered to convey coal from Seaham,—one-half owned by Lord Londonderry, and as the facilities for shipment have been improved, there is no doubt that the harbour will share in the growth of the district on whose seaboard it is situated. Other industries have been projected and carried out at Seaham and in its vicinity; the Vane and Seaham Ironworks have their two blast-furnaces; but though so near the coal they are far from the iron ore, and have been long out of blast. The bottle works have been more fortunate, and both these and the chemical works have long attained eminence both in the quality and quantity of their productions. The town has acquired, with its growth in thirty years from a population of 2,000 to one of 9,000 in 1871, its six places of worship, its institute, excellent schools, and most of the other essentials and desiderata of town life. Its school oversight is entrusted to a voluntary school committee; its local supervision in matters sanitary to a local board; whilst the family who, practically speaking, may be said to own the town, have given to it, as well as patronage, general supervision.

The jubilee of Seaham Harbour has just been celebrated, and though it cannot be said that it has grown like Middlesbrough or Barrow in those years, it has yet made, as we have seen, substantial progress, and the great industry of coal shipment, on which it chiefly depends, has known considerable development. The harbour was designed to meet, fully, the needs of an order of trade which has passed away; and the change to a new era is one not easily undertaken nor quickly completed. Meantime, in the half-century there have grown up in the locality large local industries, which have to some extent lessened the quantities of coal available for shipment at the local ports; and Seaham has not known to the full the receipt of its share of that growth of local industry. It is isolated,—to some extent by its natural position,—by what its patron has called the "terrible hills" near it; and to some extent by the fact that it is dependent upon one line of railway, of which it forms the *ultima thule*. Under these circumstances, there are not the capabilities of growth in other than the shipment of coals. But having now, to some extent, that adaptation to the altered circumstances of trade, there may be expected to be a growth in that trade. It is evident that we have entered on "an era of comparatively cheap fuel," and there should be a development of the export coal trade under the stimulus which cheap fuel generally gives. Few places are so favourably situated as Seaham Harbour for developing the trade, as its contributory collieries are close at hand; and a large portion belong to its owner, who can deliver them from his own pits, over his railway, at his dock, and ship them in his own steamers. It may not know a rapid growth, but it should know a continuing solid progress now.

THE NATIONAL HEALTH SOCIETY.

A GENERAL meeting of this society, now in its sixth year, was held on the 20th, at 44, Berners-street, Mr. Ernest Hart in the chair. Miss Lankester, the secretary, read a report from the committee of the proceedings of the year, which showed that a considerable amount of good work had been done with a small expenditure. A considerable number of lectures have been delivered, and a course of drawing-room lectures will be given at 23, Hertford-street, Mayfair, by the permission of Mr. C. Matthews, in the spring. The following gentlemen have offered to give these lectures:—Dr. Teale, of Leeds; Professor Corfield, Mr. Ernest Hart, Dr. Arthur Edis, Dr. Horatio Durkin, and Mr. Ernest Turner. Efforts have been made during the year to obtain the opening of spaces for the people, the conversion of disused churchyards into gardens, &c. The committee have been anxious during the past year to inaugurate a new branch of the society's work in the shape of a house inspection organisation. The provisional rules were submitted, and will require careful consideration.

On the motion of the Chairman, seconded by Mr. Godwin, the report was adopted, as was also the following resolution, Lady Stanley of Alderley and Miss Helen Taylor taking part in the discussion:—"That this society earnestly expresses the hope that the School Board of London will, at the earliest possible opportunity prior to the ensuing spring, find means for fitting and opening the playgrounds attached to the School Board schools, for the purpose of systematic recreation during the Saturday evenings and summer holidays."

THE FREEING OF THE TOLL BRIDGES OVER THE THAMES.

THE claim of the Albert Bridge Company against the Metropolitan Board of Works for 300,000*l.* for the Albert Suspension Bridge and old Battersea wooden Bridge is now in course of hearing before the arbitrators, and is likely to last some days longer. Various interesting points have arisen both in regard to the suspension system of the Albert Bridge and the timber of the Battersea Bridge, which has been renewed and repaired for the last 112 years. Mr. Pope, Q.C., Mr. Bidder, Q.C., and Mr. Webster, Q.C., are conducting the case for the Bridge Company, and Sir Henry James, Q.C., and Mr. Philbrick, Q.C., appear for the Board. Engineering evidence in favour of the bridges has been given by Mr. R. M. Ordish, who designed the Albert Bridge; Mr. Ewing Matheson (the chairman of the company), Mr. W. H. Barlow, Mr. C. D. Fox, Mr. Brereton, and others; and in opposition, Sir Joseph Bazalgette, Mr. Henry Law, and Mr. Edward Woods appear for the Board. The award, which is not likely to be given for some weeks to come, will complete the second group of bridges named in the Toll Bridges Act of 1877, and will allow the free opening of five toll-bridges from Lambeth to Battersea inclusive.

THE CONFUCIAN TEMPLE OF NANKIN.

A CORRESPONDENT of the *Celestial Empire* writes as follows:—

"Nothing can be more imposing, from a strictly Chinese point of view, than the Temple of Confucius, as it appears at a distance of some few hundred yards. Embracing an area many times the size of the Royal Exchange, situated upon an undulating hillock, and enriched with clumps of dark green foliage, which form an admirable foil to the huge, curved-up roofs and zig-zag walls of the inclosure, the structure appears by no means unworthy of its high position as one of the great literary shrines of China. Nor is the impression disturbed as we approach. In front of the temple is a spacious stone court, surrounded by a wall, and entered from opposite sides by two enormous gates, magnificent in ornament, material, and design. Within, we find ourselves in a vast labyrinth. On one side there is a handsome hall, or yamen, inhabited by the *lao-ssu*. This is consecrated to the more practical part of the literary religion,—study, instruction, and examination. Everywhere there are strange and tortuous paths, sloping upwards; some, indeed, are in the form of steps, so that it is impossible to avoid a mental reference to the flight which leads to the fabled Temple of Fame,—here a combination of parable and reality. The temple proper has many elements of true splendour. Before each pavilion is an immense open court, well paved with solid stone; from this we ascend by a flight of broad and massive stone steps,—far handsomer and bigger, and broader than those which lead to the door of St. Paul's,—to the first hall of worship, which is always jealously closed when no solemnities are going on. Upon either side of the court and of the steps are broad corridors, along which run, again, deep long halls of a singularly depressing and gloomy aspect, tenanted with the memorial tablets of some thousands of departed worthies. Up again we go, however, and find ourselves in another spacious court, with another flight of steps before us, as broad, and as massive, and as handsome in every way, as those we have passed already. At length we stand before the last and highest of the sanctuaries, having ascended many steps since first we entered from below; but behind we can go higher still, and by dint of clambering up a hillock overgrown with weeds we reach a spot occupied by a little handsome kiosk, which commands a wonderful panorama of the surrounding country. Before us lies stretched the whole of the northern part of the city. Immediately below is a dismal waste of dirty common, dirty cottages, and dirt in various other forms. In the middle distance gleam the white walls of the Roman Catholic establishment; further off lie the green lanes, and prosperous market-gardens, and shady copses which surround the Miao-siang Ngan, while the horizon is bounded by an undulating sweep of hills,—the Purple-Golden Mountain to the right, then the Pe-ki-kuo, with its coronet of kiosks, then the dark-red Drum Tower, and lastly to the left, the beautiful Tsing-liang Shan. To form a correct idea of it the reader must understand,—as every one who lives in China will,—that it is less a temple than a town. For streets read corridors, for squares read courts, for houses read kiosks, pavilions, and ancestral halls, and that is the Confucian Temple. The great curling roofs hang proudly over their supports, and are richly coloured by art as well as by time; the architecture of the whole is admirable, the material massive and costly, the design well-nigh complete. But the effect? Disappointing to the last degree. Nor is the reason far to find. The whole place is a neglected wilderness. The fine broad courts are covered with grass and weeds; lumber is littered all over the enclosure; the undergrowth along many of the paths comes up almost to one's waist, flourishing as luxuriantly as on the wildest mountain side; while the beautiful stone steps, just under the overhanging portico of the temple, are,—well, overhanging porticos are generally a favourite resort for birds, and the stones in the immediate neighbourhood of this one can hardly have been

cleaned for the last ten years or so. With two industrious gardeners constantly about, the Confucian Temple of Nankin might be made a charming resort; but as it is apparently against the "custom" of China to interfere with the operations of Nature, so far as to root up weeds and keep things clean, it is a dirty, slovenly, and shamefully-neglected place."

FIRES IN THEATRES.

MR. FÖLSCH, whose valuable work on Theatre-burning was reviewed in these columns (*Builder*, vol. xxxvi., pp. 423, 691) at some length, has sent us the following list of seventeen theatres which were completely destroyed by fire in the year 1878, viz.:—

Jan 22. *Wandsbeck*, near Hamburg.—Reisner's Tivoli Theatre, burnt down at night.

Feb. 4. *Wigan.*—Queen's Theatre, large wooden building, burnt down soon after close of representation.

Feb. 5. *Chicago.*—Academy of Music, destroyed by fire after close of representation.

March 26. *London.*—Elephant and Castle Theatre, burnt down at night.

April 6. *Oldham.*—Theatre Royal, destroyed by fire early in the morning.

April 27. *South Shields.*—The Alhambra Music-hall and Amphitheatre, burnt down after close of representation.

May 1. *Wittenberge.*—Centralhalle, Theatre, and Ball-house.

May 11. *Ahmednuggur*, India.—Theatre burnt down during representation. Panic. Forty persons killed, and many others badly hurt.

June 13. *Plymouth.*—Theatre Royal, burnt down immediately after representation.

July 16. *Bradford.*—Prince's Theatre, burnt down after close of representation.

July 19. *Mont de Marsan*, France.—The Amphitheatre, destroyed by fire, with five other buildings, in the afternoon.

July. *Nischny-Nougorod.*—Theatre burnt down during an illumination for the presence of the Grand Duke.

Aug. 25. *Cologne.*—Der Gertrudenhof, burnt down in the evening, after a concert. Fire commenced on the stage.

Sept. 2. *Canal Dover*, Ohio, U.S.—Sells Brothers' Circus, small temporary building, blown down by wind during the representation, the *débris* ignited by the oil lamps.

Sep. 25. *Blackburn.*—Star Theatre, built of wood, burnt down in the night.

Nov. 14. *Bradford*, Pennsylvania, U.S.—The Théâtre Comique, burnt down, with fifty houses. The fire commenced over the stage.

Dec. 9. *Constantine*, Algiers.—Theatre burnt in the night.

WARMING AND VENTILATION OF CHURCHES.

SIR,—Allow me to reply briefly to the letter of "M. & S.," which appeared in your last week's issue, on the oft-recurring question of "the ventilation of churches and the prevention of down-draughts."

There is no doubt the evil of "down-draughts" exists, and must exist, in every church warmed (not ventilated) by any of the systems usually adopted, although, in many instances, by the exercise of a little care on the part of the man in charge that evil might be greatly mitigated.

One step in the right direction is to heat the church before the assembling of the congregation, allowing the fire to burn itself slowly out during the day of the services; but the remedy is by a carefully-designed and scientific arrangement of apparatus with channels for the admission of fresh and warm air, and others for the extraction of the vitiated air.

This can only be effected by special structural arrangements, requiring the co-operation of the architect, and which should be designed and decided on before a stone of the building is laid, care being taken that all openings, whether for inlet or extraction, are properly proportioned and distributed.

In almost every instance of church building, the warming is an after consideration, and no alternative remains but to fix the boilers or stove here, and the pipes there.

The plan I venture to suggest in the case of warming a church by hot water, would be to lay the pipes in channels built under the floor, and alongside the north and south walls, of such dimensions as to admit the entrance of a man on his hands and knees, in order that the pipes could be examined and repaired at any time, supposing such a necessity occurred.

The channel in which the pipes are laid to be supplied with fresh air from the outside, under control, and the warmed fresh air delivered into the church through a running skirting ventilator, or by flues carried up in the side walls, discharging at any height; in either case the warm air ascending in this way would entirely cut off the descending currents of cold air, and dispose of the inconvenience invariably complained of by persons seated near the walls of the church. For the extraction of the vitiated air, other channels constructed under the aisles and connected with numerous openings in the floor or risers of the seats would be necessary. The openings to be generally distributed over the church, so that the escaping air has no great velocity at any particular point, and no perceptible draught created. These main eduction channels to discharge themselves into a vertical shaft carried up in the tower.

An economy would be effected by so arranging the extraction flues that on starting the apparatus before the church is required for use, and when the air in it is pure, the supply of cold air from the outside could be shut off, and the air in the church conducted to the channels which contain the pipes, the current being diverted, and the external fresh air admitted just before the service. This might be very simply arranged.

The expense of constructing these channels as the building proceeds, would not, I venture to say, exceed that incurred in many instances under the ordinary system, where the warming has been an after consideration, and ventilation entirely ignored.

For summer ventilation openings should be provided near the roof, or high up, communicating with the extraction shaft, and under control.

A thorough explanation of the plan suggested would entail a long description and diagrams, but I will not trespass further on your space.

St. Neot's. W. ALLOWAY.

*** Several patentees request to be put in correspondence with "M. & S.," but this is not our object. We seek information for all.

VENTILATION OF CHURCHES.

SIR,—"M. & S.," at p. 81, ask how to ventilate churches, &c., without down-draughts being felt. One way to do it is to so put in the up-cast shaft that if down-draughts do take place these will not come right down upon the congregation, but be deflected either perpendicularly or at a certain desired angle upwards. How to do that practically will be explained in a new patent of mine which I expect to be published in a month or so; but if "M. & S." are architects, I shall be glad to freely explain to them my method, and allow them freely to try it in part or whole, but at their own expense, at such building as may be mutually agreed upon, and they are at liberty to publish the result.

W. P. BUCHAN.

21, *Renfrew-street, Glasgow.*

COST OF ENGLISH AND FOREIGN WORKMANSHIP.

SIR,—The letter written by your correspondent Harry Hems in your last week's issue (p. 80) is, I think, liable to give your readers a false idea of the cost of English and foreign art-workmanship, and to be greatly detrimental to our English art-workmen. I have had considerable experience in the employment of both, and I have always found that foreign art-workmen, instead of working for half their value, as Mr. Hems infers, demand more money than they are actually worth in comparison with Englishmen, and I have not yet found one, however inferior, who is willing to receive less than 1s. or 1s. 2d. per hour, in addition to customary cab-fares and expenses when from home. SEAGIRT ALBION.

ACOUSTICS.

SIR,—My attention has been drawn to the article on acoustics in your valuable paper of the 11th instant, pp. 44 and 45.

The application of the principle having been secured to me by Royal Letters Patent a few years since, for this country, I think it best (by your permission) to inform your numerous readers of the fact. This is my apology for writing you. GEO. L. SHORLAND.

AMERICAN PLASTERERS IN EDINBURGH.

ROBINETT *v.* NEILL.

SOME dissatisfaction having arisen amongst a number of American plasterers as to an engagement made by them at New York, in September last, for employment in Edinburgh, one of their number, Matthew Robinett, sued George Neill, secretary of the Edinburgh Master Plasterers' Association, as representing that body, at the Small-Debt Court, on the 15th instant, for 11*l.* 18s. 6d., alleged to be due through breach of agreement.

It appeared that in the course of the strike of operative plasterers in Edinburgh, a messenger was despatched to New York in search of men. He procured twenty-three, the stipulations being, according to the Americans, that they were to receive six months' continuous employment of fifty-one hours a week at 9d. an hour; that they were to be paid wages at that rate during the voyage, and have their passage-money advanced. The pursuer, therefore, claimed 3*l.* 16s. 6d. (less 6s. paid) as allowance for time (102 hours) spent in crossing the Atlantic, and 8*l.* 8s. as loss through reduction of hours and want of work.

The pursuer said that, in September last, an advertisement appeared in the New York papers offering employment in Edinburgh to 100 plasterers at the rate of 9d. an hour, with free passage. He and several others made application to the agent, Mr. Day, and entered into verbal engagement with him for six months' constant work of fifty-one hours a week at the above rate, no matter whether stopped by frost or rain. Their passage was to be paid, but to be deducted from their wages at the rate of 3s. a week. They were informed that there was no strike in Edinburgh, only a scarcity of men; that the rules and regulations in force in the trade there would in no way interfere with them; and that their comfort would be attended to on arrival. On reaching Edinburgh they were provided with board and lodgings for one day, and then left to "fish" for themselves. They started work on the 10th of November, and, after working for about a month at full time, their hours were reduced to eight and a half, and subsequently to eight, seven and a half, and seven, and ultimately they were thrown idle altogether. During the time witness was idle, he received sums from his employer amounting in all to 30s. Before leaving New York he was in regular employment, and was paid at the rate of 2½ dols. a day. A committee was appointed to complain about the breach of agreement, but they obtained no redress, and the American consul at Leith was then consulted on the matter. Hence the action.

Five men placed in a similar position to the pursuer gave corroborative evidence.

Robert Day, joiner, who was deputed to go to America in search of men, said he was employed to do so by the defender, Mr. Neill. His instructions were to engage them on the best terms he could, and the wages were to begin from the time they began work in Edinburgh. He engaged twenty-three. The agreement was verbal, and was to the effect that they were to receive 9d. an hour; that nine hours' work would be afforded in summer, but that the hours might be reduced in winter. At the same time he informed them that very little time was lost in Edinburgh in the winter, in consequence of the mildness of the climate. He did not lead them to believe that their wages were to date from the time of the agreement. He informed them that there was a strike in Edinburgh. He was of opinion that he could have got 500 on the same conditions in New York, in place of twenty-three. The document which the pursuer signed at the time of the agreement contained the words "full employment for six months from date hereof"; but witness did not understand from that that wages were to be paid for the time occupied by the voyage.

The defender said he told Day to tell the men that there was a strike, and if there was any difficulty in getting hands, to offer to pay a half or the whole of the passage-money, on condition that the men signed a document to the effect that they would refund the money. Nothing passed between him and Day as to the number of working-hours, and the men made no complaint to him when the hours were reduced. When they were stopped by frost they applied to him for relief, and he gave it them. The first claim made on him for wages during the passage was the present summons. He would not give the names of the master plasterers who authorised him to send to America for men. There was not a constituted association of master plasterers in Edinburgh, so far as he knew.

Sheriff Hamilton thought the statement of conditions taken to America by Day was merely to be shown to the men. He did not think it was intended, or that Day had power, to make them believe they should be paid wages during the voyage or when idle. He thought it would be quite impossible to work out such an agreement for six months from the date of engagement, and he accordingly gave decree of *absolvitor*. His Lordship at the same time said he sympathised with the pursuer if it was the case that he left a situation in New York where he was in receipt of two dollars and a half a-day.

CONTRACTORS AND SUB-CONTRACTORS.

AT Marylebone, Joseph Wheeler, of Mill Hill, Hendon, was summoned under the Employers and Workmen Act, for wages due to two men he had employed. Mr. Kisch, solicitor, appeared for the defendant.

Messrs. Kirk & Randall, builders and contractors, of Woolwich, had a contract to do work at the Paddington Station of the Great Western Railway, and the defendant sub-contracted with them to do a portion of that work. He accordingly engaged a number of men, and the work was proceeded with, but, in consequence of something that occurred, the men were told to book their time at Messrs. Kirk & Randall's office. The defendant still continued the work but later ceased to go on with it, and it was ascertained that he had overdrawn his account with Messrs. Kirk & Randall. The men he had employed being unable to obtain the money then owing to them, summoned him before the magistrates at Edgware, and it being there contended that the men had become the workmen of Messrs. Kirk & Randall by their being instructed to book their time with them, the magistrate dismissed the summonses, and the men were told their remedy must be against Messrs. Kirk & Randall. Summonses were accordingly taken out

against those gentlemen at this court, and were heard on Saturday. A solicitor who represented them said that, although they were very sorry for the position in which the men were placed, they could not pay the money twice over, the defendant Wheeler having already been paid.

A witness, one of the men engaged by Wheeler, was put into the witness-box, and on saying that he had always looked to him as his master, and had never considered that he had been engaged by Messrs. Kirk & Randall in any way, the summonses as against them were dismissed, Mr. De Rutzen remarking on the great hardship it was for the men to be kept out of their money. Finding the Court had jurisdiction in the matter, he granted fresh summonses against Wheeler, and, the case now being again gone into, Mr. De Rutzen said that, with all due deference to the Edgware magistrates, he considered Wheeler clearly liable. He should make an order for the payment of the money due to the complainants—namely, 16s. 4d. in one case and 18s. 9d. in the other, with costs.

It was understood that there were some twenty-eight other men who had claims against the defendant, and Mr. De Rutzen advised him to come to a settlement with them, or otherwise, if summonses were asked for, they would certainly be granted.

MASTERS AND MEN.

Huddersfield.—The master builders at Huddersfield have given notice to determine, on May 1st, the rules under which masons now work. The masters' intention is to reduce wages and increase the hours of working, but no definite scale has yet been settled.

Sheffield.—On the 17th inst. a largely-attended meeting of the members of the Operative Bricklayers' Society was held at the Pheasant Inn, Broad-street, Park, to hear a proposal which had been received from the master builders with reference to alterations in the rules of the trade agreed to between the masters and the men. On the 3rd of January the masters gave notice to the men that a reduction in their wages would take effect from the 1st inst. They did not, however, state the amount of the reduction, and when asked what it was to be, claimed ¾d. per hour and the right of alteration of the rules. The men said they must know what the alterations were to be before they could submit, and the employers promised to make the proposed alterations and submit them to the men. The rules, as altered, were laid before the meeting on the 17th, and the men declined to accept the alterations. After some discussion, the secretary was instructed to convey to the masters, as the feeling of the meeting,—"That the bricklayers do not accept the terms offered to them by the master builders in their letter of the 16th, in which they erase a number of the rules which have been for many years agreed to and carried out both by the employers and employed." With respect to the reduction, it was afterwards resolved,—"That we, the operative bricklayers of Sheffield, are willing to accept a reduction in our wages of ½d. per hour, viz., from 9d. to 8½d. per hour, on condition that the master builders accept the whole of the rules as mutually drawn up, agreed to, and signed by the representatives of the Master Builders' Association and the Operative Bricklayers' Society, in 1875; the above reduction to take effect from the date on which the master builders agree to accept the terms." It was subsequently resolved that the men would not resume work until an answer had been received from the employers.

Staffordshire Nailers.—It has just been decided by the members (says a Central News telegram), to break up the nailers' trade union in Staffordshire. The operatives are stated to admit the futility of contending against the masters any longer, seeing that the Worcestershire operatives do not help, but rather oppose, by working for a less rate of wages.

CRITERION THEATRE.

SIR,—In last week's *Builder*, on p. 75, Mr. Verity states that the iron hoods and flue pipes connected with the batten lights of the Criterion stage are coated with Leroy's cement. This must be a slip of memory, as they were coated by us with Spence's patent nonconducting composition. As this is a matter of some importance to our reputation, we rely on your usual courtesy to make a correction in your next issue.

C. W. SMITH, SON, & Co.

POWDERED FLINT.

WILL some of your correspondents kindly inform me the best means of reducing flint stone to powder in large quantities? Is it by heat? and, if so, the most economical way of applying it?

A. B. C.

Slating.—"Alfred Baker's Table," advertised in our columns, shows the comparative cost of roofing slates per 1,200, per 1,000, and per foot square. It will be found useful as well by architects as by builders and slate merchants.

JENNINGS'S IMPROVED SINKS.

A NUMBER of years have passed since we first spoke of Mr. George Jennings as "the indefatigable." At that time he was struggling into notice, and a few words of commendation were valuable to him, and esteemed. Since then fortune has smiled on him; hundreds of workmen fill his factories; his name in connexion with sanitary arrangements is known far and wide, and he is probably independent of praise or blame. Still, however, he continues to be "the indefatigable George Jennings." And here is one of the latest evidences of it. For buildings now in progress for the Victoria Dwellings Association, the architect to the Association, Mr. Chas. Barry, was anxious to obtain a sink which should fulfil certain conditions, and explained these conditions to Mr. Jennings. In a very short time a sink to comply with them was devised and patented, and is now being made in considerable numbers to meet the demand. We will not describe it, suffice it that it seems to us after examination a very good one, and that he is quite justified in claiming that it forms (1) for the cook, an excellent tub for washing plates, dishes, and vegetables; (2) a convenient wash-tub for the housewife for her linen; (3) for the labourer's wife it answers not only for the above, but the additional purpose of a child's bath or a commodious lavatory for her husband on his return from work; (4) lined with white pine it forms the best possible sink for butler's pantry, for washing plate, china, and glass, the breakage due to the employment of ordinary sinks being avoided, and loss of spoons (owing to a grating carelessly removed and thrown aside), impossible; and (5), arranged for the reception underneath of a small grate or fire-box (in houses without a hot-water circulation), it answers all the purposes of an ordinary copper.

CHURCH-BUILDING NEWS.

Monkleigh.—The parish church of St. George, at Monkleigh, a village three miles from Great Torrington, has just had several additions made to it internally. The church is a Perpendicular building, consisting of nave, chancel, south aisle, and chancel aisle, north transept, and western tower. The church was restored generally in 1863. The recent additions have been carried out under the professional supervision of Mr. W. R. Brydon, architect, of Bideford. New oak seating has been placed in the Annery chapel. The old carved bench-ends have been re-used, and the seats made substantial and strong, whilst new seating has also been placed in the transept. This work has been carried out by Mr. Lewis Ellis, the local carpenter and sexton of Monkleigh. The tower contains five bells; these have been thoroughly overhauled and rehung, by Mr. Hooper, of Woodbury, and a chiming apparatus has also been put up, by Mr. Seage, of Exeter. A parclose screen has been erected between the chancel and the Annery aisle. It consists of several bays, springing from octagonal columns, and the upper part is rich in worked and carved tracery. The whole is surmounted by a deeply-moulded and carved cornice. At the eastern end is a doorway. This screen has been made and placed in position by Mr. Harry Hems.

Birtley.—St. John's Church has been re-opened, after renovation and the addition of a new organ-chamber on the north side of the chancel. The floor is raised 5 ft. above the chancel-floor, and the chamber is half octagon on plan. The organ has been removed from the old gallery, and the case remodelled. The work has been executed at the sole cost of Colonel Sheppee, of Picktree House, in memory of his uncle, the late Augustus Henry Hunt, of Birtley House, Birtley. A new two-light window has been added to the south side of the chancel, and filled with stained glass by Clayton & Bell. The subject is the Good Samaritan. The cost has been defrayed by subscription from the inhabitants and workmen of the Birtley Iron Company, in memory of Mr. A. H. Hunt. The whole of the work has been designed and carried out under the superintendence of Mr. Charles F. Armstrong, of the firm of Lamb & Armstrong, architects, Newcastle-on-Tyne.

Castle-frome.—The parish church of Castle-Ffrome, Herefordshire, is about to be re-opened, after restoration under the direction of Mr. Martin Buckle, architect, Great Malvern, Mr. William Porter, of Malvern Wells, being the contractor. The tower, spire, and porch were found to be in a most dilapidated condition, and have been entirely renewed, the old lines of the former half-timbered ones being strictly adhered to. The roof, also, has been renewed and restored to its original pitch, and the old oak ceiling beams cleaned and repaired, and the panels filled in with pitch pine boarding. A new vestry, with heating-chamber under, has been added. The plaster has been taken off the inside, and the old Norman walls repointed. Encaustic tiles have been laid in the chancel, and the church has been reseated throughout.

Poltimore.—Mr. R. M. Fulford, architect, Exeter, has been consulted as to the restoration of the parish church of St. Mary, and has prepared drawings for the proposed works. Of the original seating, one bench-end has been preserved. It is of unusual solidity, and of quaint and uncommon detail, both as regards its mouldings and carved ornament. Only a few of the new seats have yet been placed in the church, and these stand in the north transept. They are of well-seasoned English oak, massive as the old bench-end just referred to, and the carving in unison therewith. The ancient end is incorporated in one of the new benches. The work is to continue. What is already done is by Mr. Harry Hems, Exeter.

Books Received.

Pretty Arts for the Employment of Leisure Hours. A Book for Ladies. By ELLIS A. DAVIDSON. With illustrations. London: Chapman & Hall. 1879.

WHY "for ladies"? We fear this book is a little behind the age. The "arts" with which it deals include wood-engraving, wood-carving, etching, lithographic drawing, &c. The time has nearly gone by when ladies who will take the trouble to acquire or practise any such occupations as these will be content to regard them as elegant trifling, or to imagine that there is anything peculiarly ladylike in taking up such studies superficially *pour passer le temps*. Among ladies who care for art-work at all, we can testify that, as far as our experience goes, there is nothing which makes them more indignant than to have it supposed that there is any ladies' way of art different from,—slighter than,—that practised by men and artists. Ladies who take up any branch of art now generally do so with a will, and not in a mere "leisure half-hour" manner. And it is well that it should be so. Any artistic work is worth doing well if it is worth doing at all, and nothing is more insufferable than "pretty" art, drawing and modelling carried out in a toy way, and with no real purpose in it. And fancy including etching under such a category as "pretty arts,"—etching, which is simply worthless unless there are the mind and feeling of an artist presiding over the scratching and biting. This will never do.

The one way in which Mr. Davidson's book may be of practical use is that it gives descriptions of the tools required in practising the various occupations named, which may serve to tell the reader who wants to etch or to engrave, &c., what to get, and from whom to get it. It is not so precise in regard to some matters of information as it might have been; under lithography, for instance, there is no hint that on the stone the drawing must be made the reverse way, a thing very likely not to occur to a beginner; and no mention of the way out of this difficulty (if it is found one) by the use of "transfer-paper," which, in fact, is in every way a much more convenient medium for amateur drawing on stone, than working on the stone direct. Nothing is said under "etching" as to dry-point work, which certainly should be mentioned. To this and other chapters must be appended the addendum which we suggested for another popular book the other day,—"First learn to draw." Card models and leather-work may come properly under the heading of "pretty arts," but it is vexatious to see them bound up with real fine-art processes, as if any one who could do one could do the other. The book is well meant, but it is a mistake.

VARIORUM.

THE first article in the new number of the *Quarterly* is a delightful account of Lessing, with a review of his works and his position in the world of letters. Germany owes much to this strange, wild genius,—"Lessing unloosened

by the power of his touch, the tongue of his countrymen, then in the cradle of their literary revival, and feebly attempting to stammer forth ideas in a language which since Luther's days had been left to lie without culture."——A new and compact edition of Lessing's "Laokoon," by the way, is before us, as a volume of the Clarendon Press Series, German Classics (Macmillan & Co.), edited with English Notes by Dr. Hamann, who has prefixed an excellent Introduction. "To realise the effect wrought by Lessing's 'Laokoon,'" wrote Goethe, "one must be young; it transported us out of the region of trivial observation into the limitless area of thought."——"Cast-iron Pipes" is the title of a pamphlet by Ernest Benedict, C.E. (Spon), which gives the result of the author's experience, while passing 30,000 tons of cast-iron pipes, during which time he learnt, as he says, much that was new to him. Many will find valuable the knowledge Mr. Benedict thus acquired.——The Municipal Corporations Companion and Diary (Waterlow & Son) has taken its place in the list of useful annuals. The new issue includes an explanatory Index, which shows at a glance the judicial and administrative character of each borough; a Table of the Municipal Acts, from 1835, which form the series proposed (by the Lord Chancellor) to be consolidated in the next session of Parliament; and a detailed and interesting account of the whole of the Ancient Corporations, which have been inquired into, and will be shortly reported upon by the Royal Commission on (Unreformed) Municipal Corporations.

Miscellanea.

A New Mersey Tunnel Scheme.—The Liverpool papers give details of a new Mersey Tunnel scheme. The railway tunnel scheme is stated to have practically collapsed, but the new proposal is to construct a tunnel for pedestrians, and for tramways and other vehicular traffic. It is proposed that the underground roadway should commence opposite the open space in front of St. Nicholas's Church, then make a detour to the left, and pass underneath the Chester Wharf and the entrance to the Manchester Dock. It will then pass underneath the river, come out near to the Morpeth Branch Dock, and be brought into direct communication with Argyle-street, the main street in Birkenhead. The proposed tunnel is to be a double one, with two arches, each arch having a footpath for pedestrians, a tramway road, and two lines for carriage and cart traffic, making in all three lines of road in each direction, in addition to the accommodation for foot passengers. As the bottom of the river is composed of solid sandstone rock, no engineering difficulties are apprehended. When completed, —which it is expected will be in about two years after the tunnel has been commenced,—each arch will be lighted throughout, perhaps with the electric light. The total length of the roadways will be 2,360 yards, or one mile and a third, and the entire cost is estimated at from 300,000*l.* to 400,000*l.* The gradients will be on an average about one in twenty-five, being the same as those in most of the London bridges. Tolls are to be charged. The intention of the promoters is to create a public trust, guaranteed in certain proportions by the Dock Board, the Corporations of Liverpool and Birkenhead, and the various interested railway companies.

Engineering Trade.—Messrs. Matheson & Grant's Report says the value of commodities, which six months ago had reached, it was hoped, the lowest point, has since continued to fall in all branches of the engineering trades, and the renewal of confidence which was looked for from the Berlin Treaty has been again postponed by the Afghan war and the recent financial failures. The evil system which these failures disclose has injured not only those immediately concerned, but has, by a forced depreciation of prices, helped to ruin many honest traders. To those who are aware of the real cost of manufacture, it is evident that even now the end has not arrived; and till the credit or borrowing sources are exhausted of the firms who, without funds of their own, are working at a loss, and who postpone the day of reckoning rather than acknowledge their insolvency, it is useless to hope for remunerative prices. The banks who provide the funds share in the disaster, and it is worth noting that such alliances are not confined to this country.

Locks and Locksmiths.—Messrs. Chubb & Son, who have certainly a right to be heard, are not contented to let Mr. Jas. Hill's statements (see p. 82, *ante*) pass *sub silentio*; they say:—"It is incorrectly assumed, both by the Colonel and by Mr. James Hill, that all English locks are of one class, consisting 'of a number of small parts exact counterparts of one another'; but as Mr. Hill owns he is not a manufacturer, preferring 'to be a merchant only,' it may be necessary to inform him that in a superior quality of lock it is not desired to make a large number precisely alike, which any one of their keys will open, but rather to produce the greatest possible variety of combinations with different keys. In order to effect this a certain amount of skilled workmanship has to supplement the products of machinery, and will always continue to do so. We were acquainted with the workmanship and finish of American locks long before contractors were tempted across the water by large discounts, and while readily acknowledging the general utility and neatness of these goods, we maintain they show no improvements affecting real security superior to those effected in this country. Scarcely a year passes in our own works without either master or men adopting some improved alteration of manufacture, and we know of numerous other cases where special machines have been made for the trade. But besides all this, Mr. Hill, in his zeal for his new friends, overstates his case against the British workman. We have employed hundreds of men at our Wolverhampton factory during the last fifty years, and have no hesitation in saying that they have been as sober, saving, and honest in their work as any similar number of Americans."

The Canadian Timber Trade. — The statistics of the Canadian timber exports for the year just closed are of especial interest to the trade in this country at the present time. They show that there has been a great falling off in the trade of the port of Quebec, the arrivals of sailing ships from sea during 1878 being 662 vessels, 503,912 tons, as compared with 958 vessels, 763,423 tons in 1877, showing a decrease of 296 vessels, 259,511 tons; while the clearances for sea (timber laden) were 476 vessels, 399,833 tons, in 1878, against 796 vessels, 670,627 tons, in 1877, showing a decrease last year of 320 vessels, 270,794 tons. The limited demand in the British markets, together with the great decline in prices, are stated to be the reason of this serious decrease in the exports; heavier stocks are left on hand than at the end of 1877, and it is expected that the production this winter of all kinds of goods will be exceedingly light. The past season is described, both by manufacturers and shippers, as being one of the dullest and most unsatisfactory on record, and merchants of old standing cannot recall a year in their long experience during which the trade suffered so much from depression, doubt, and the want of a healthy demand. It is hoped that the efforts now being made by the Canadian Government to induce the French authorities to remove the differential duties against Canadian-built ships will, if successful, lead to extensive orders from French shipowners.

Spithead.—We are informed upon the best authority that the statement inserted in our issue of the 11th inst., to the effect that there had been a percolation or leakage through the roof of the No Man's Fort at Spithead, is not justified by the facts, which simply are, that in consequence of the severe frosts, and subsequent damp weather, a great condensation of moisture had taken place on the inner surface of the iron curved plates composing the roof of the casemates, and which had resulted in a good deal of dripping and discomfort, and nothing more, and that it can easily be remedied by a coating of powdered cork, similar to that which has been most successfully applied in the magazine of the same fort, and also of some of the iron ships of the Navy,—the means of adhesion being a mixture of certain paint materials. Although such a coating is indispensable in the magazines, nothing but such a very exceptional degree of cold as has lately been experienced has suggested that it would be at all necessary in the casemates. We are assured that there is no leakage whatever through the roof or any other portion of the structure.

Revolving Shutters.—We understand that Messrs. Grafton & Co. have been appointed Steel Shutter Contractors to the French Government.

A Drawback to Brighton.—"A Bird of Passage" writes to a Brighton paper:—"In spite of all the improvements effected in Brighton, there is one respect in which the 'Queen of Watering-places' lags behind. You have one of the most magnificent seaside drives in the world; but all your visitors are not carriage people; all do not ride; and of those who do, many also enjoy the invigorating exercise of the promenade. Now, there are in Brighton no facilities for walking by the sea. There are no sands,—nothing, at all events, to speak of,—and the idea of tramping along on the shingle for any distance is not inviting. While a broad promenade has been formed at the cliff's edge, and another in a more sheltered position below it, both of these are of such material as to be detestable to the pedestrian either in fine or wet weather. In fine weather the gravel grinds painfully under foot, destroying all comfort, while a little rain converts the path into mud, variegated into pools and puddles of water. In almost all the watering-places with which I am acquainted, the sea-frontage walks are asphalted. It is so at Margate, Folkestone, and Hastings, for example, and the result is that one walks on velvet. The perfectly smooth surface is equally delightful in wet as in dry weather,—always clean and always inviting. The most tender-footed pedestrians find it a pleasure to be out and about in all weathers, whereas in Brighton the walks by the sea are always formidable, and often absolutely deterrent."

Manchester and Salford Ladies' Sanitary Reform Association. — The annual general meeting of the Manchester and Salford Ladies' Sanitary Reform Association was held on Tuesday. The Bishop of Manchester presided. Mr. E. A. Leigh (hon. sec.) read the annual report, which stated that notwithstanding the great distress arising from the badness of trade which had prevailed, the association had been able to maintain the same number of mission women as last year—viz., 13. A great amount of work had been done in the various districts. It was not possible to help noticing the close connexion between dirt and drink. Intemperance seemed to destroy ordinary sensibilities, and to make it possible for people to live with apparent contentment in a state of filth and wretchedness most distressing to behold. This association and the Manchester and Salford Sanitary Association were on the eve of amalgamation, so far as regarded their work. Arrangements had been made by which several of the medical members would deliver addresses upon sanitary matters in the different districts. Mr. T. Dale (hon. treasurer), read the financial statement, which showed that the receipts for the year, inclusive of a balance of 14*l.* 18s. 8d. in the bank at the commencement of the twelve months, amounted to 447*l.* 17s. 11d.; and after payment of all expenses, there remained a balance in the bank of 10*l.* 16s. 7d.

Improvements in St. Paul's Churchyard.—The *City Press* announces that the Coal and Corn Finance Committee having had before them plans and estimates for the embellishment of the ground around St. Paul's Cathedral, have made choice of such as seemed to them to meet the wishes of the Corporation upon the matter. The railing on the north side of the churchyard will be lowered, and a new gate formed at the north-east corner, by Cheapside. On the south side the railing will be shifted within the churchyard, so as to allow of the formation of a public footway on the outside. The contract for this portion of the work will be undertaken by Messrs. Mowlem & Co., whose tender for 2,480*l.* has been accepted out of four sent in. Mr. E. Milner, of Norwood, will superintend the laying-out of the ground. The whole of the north-east, south-east, and south-west of the churchyard will be planted with trees and shrubs and flower-beds, and the customary accessories of the landscape garden will find their place in the development of the work. The amount of Mr. Milner's tender is 500*l.* A fountain is to be erected to the north-east of the churchyard, which will probably be embellished with a statuette of St. Paul. The work will go forward immediately upon the signing of the contracts, under the personal supervision of Mr. A. Murray, acting for the City Architect.

New Associates of the Royal Academy. At a general assembly held on Wednesday evening, Messrs. Valentine C. Prinsep, S. Luke Fildes, and J. M'Whirter, painters, were elected Associates of the Royal Academy of Arts.

Manchester Academy of Fine Arts.—The annual meeting of the Manchester Academy of Fine Arts was held on Tuesday evening, at the Royal Institution, Mr. R. Crozier (president) in the chair. Mr. H. Hadfield (secretary) read the annual report of the council, which stated that the association remained, the council believed, in a healthy and vigorous state, and was fully answering the end for which it was instituted. This belief was not founded alone upon the fact of the increased number and excellence of the works sent in for exhibition, but also upon the earnestness of study manifested by those attending the life class. The academy at present consisted of nine honorary and forty-four ordinary members, eighteen associates, nine lady exhibitors, thirty-eight male and twenty lady students, being two ordinary members, four associates, one lady exhibitor, five male and twelve lady students more than given in last year's report. The last yearly exhibition was in every sense an advance upon the preceding one, 98 out of 495 pictures having been sold; and the council trusted its successor, now close at hand, would show no symptoms of deterioration. The council experienced a great disappointment in connection with the exhibition at Peel Park. But for the subsidy allowed by the Salford Town Council, the council would have suffered considerable loss in connexion with that exhibition.

Singular Fatality in Liverpool.—The dead body of Mr. John Richard Charles Ives, brother of the contractor for roofing the new portion of Lime-street Railway Station, was found the other morning lying in an excavation inside the station. The hole, which was about 10 ft. deep, was made for the foundation of one of the columns supporting the roof. At the bottom was a quantity of loose earth, and an old iron casting was left partly embedded in the soil. The deceased's body was found lying between the side of the excavation and the casting, his face being buried in the soil. The side of the excavation near the cab-stand in the interior of the station is protected by a rough barricade, and immediately adjoining the hole is a hut, which is used as an office by the contractor. Late on the previous evening the deceased was observed walking towards this hut, and he was not seen alive afterwards. It is supposed that he missed his footing on the edge of the excavation, and fell downwards upon a sharp projection of the iron casting, thus sustaining the injuried to his head and face, and, being stunned by the fall, he was probably suffocated amongst the loose earth.

"Bright Buoys."—A correspondent recently (p. 1209 of our last volume) called attention to the advantage that would accrue from illuminating the buoys which mark channels and wrecks. That these buoys are frequently destroyed or displaced by vessels running along the coast on dark nights is well known. We now learn that after two trials of lighted buoys the Trinity Board have resolved upon sending a buoy of which the lantern can be kept continuously burning to a station off Dundee. The first of these trials took place in August last at the Trinity Wharf, when the light lasted uninterruptedly for twenty-eight days. Water was pumped upon it from a steam-engine, to see what would be the effect of the shock and drenching, and no harm was done. The buoy was then sent down to the Nore, and there burned steadily for twenty-four days. The same buoy has now left London for its appointed place near Dundee. Provision has been made for keeping it alight without any interference for thirty-four days. The illuminating apparatus is a modification of what is known as Pintsch's compressed gas system.

Architectural Association.—At the ordinary fortnightly meeting on the 17th inst., Mr. H. L. Florence, president, in the chair, the following gentlemen were elected members, viz.:—Messrs. V. Vagnolini, W. M. H. Burkitt, B. V. Westbrook, J. S. Blake, H. M. Newlyn, D. J. Budge, H. Ough, A. Ebbs, H. G. S. Young, L. Edwards, J. G. Hall, A. W. Bowen, R. Beesley, W. H. Bendle, G. S. W. Tappen, B. A. Elphicke, J. B. Chubb, and C. E. Jamieson. It was announced that the first visit to buildings in progress during the current session would take place this Saturday, the 25th, to the Grand Hotel, Charing-cross. Mr. Thomas Blashill then read a paper on "Party-walls," which was followed by a discussion. We give a report elsewhere.

Gas from Water.—As a consequence of a long series of experiments, about fifty in number, each extending over several hours, and during which pressures amounting to 100, 200, and 300 atmospheres were employed, M. Bouvet, says the *Electrician*, invariably recognised the existence of the two following laws:—First, the decomposition of water by a current is independent of pressure; and, second, the quantity of electricity necessary to decompose a given weight of water is sensibly the same, whatever may be the pressure under which the decomposition is effected. The author has, moreover, observed that the oxygen and hydrogen gases are disengaged with equal facility, whatever may be the pressure. These two gases may be collected in a single receiver or in two; and in no case are there any secondary phenomena determining a recombination, even in part. The handling of the receiver containing the detonating mixture at a very high pressure is unaccompanied by any danger.

Glasgow Building Regulations. — The annual meeting of the Glasgow Landlords' Association was held on the 15th inst., Mr. A. Stewart presiding. The report stated, with reference to the proposed building regulations for Glasgow, that the changes contemplated were such as should not be made without compensating the proprietors. The chairman, in moving the adoption of the report, dealt with the various objections the Association took to the proposed regulations, stating that a single apartment house, containing 700 cubic feet, could at present be let to a man, woman, and child, but if the regulations became law only one adult and one child could occupy a house of that capacity. The idea of making closes 5 ft. wide, and staircases 4 ft. 6 in. wide, appeared to him perfectly preposterous. Speaking of the condition of the building trade, he believed prosperous times would return sooner than some people imagined. The report was adopted.

Anti-Rust.—An exhibition of the patented process of M. Dode, of Paris, for coating metals with platinum, has been given by permission of Messrs. Johnson, Matthey, & Co., on their premises, 75, Hatton-garden. M. Dode's process consists of painting the article to be coated with a composition of borate of lead, oxide of copper, and turpentine. The article is then exposed to heat for a short time, and when cool is lightly covered with a solution of platinum and essential oils mixed with borate of lead, litharge, and amylic alcohol. The article is then again heated, and as soon as it ceases to smoke the process is completed, and the platinum coating is seen of a silvery whiteness. The inventor claims that when a metal has been coated on his plan no oxidation can take place. The practical value of this invention will depend upon the cost of the application.

The Electric Light in the British Museum.—It is stated that an experiment is about to be made to test the advisability of illuminating the reading-room at the British Museum by the electric light on the Siemens system. We hear, however, that opinions are divided, on account of the difficulties attending the operation, between the suggestion of one central light suspended from the apex of the roof, and a greater distribution of the lighting power by the adoption of several standards throughout the room. The experiment is conceived directly in the interests of evening students.

The Railway to Cochin. — The *Cochin Argus* states that Mr. Hudson, the chief engineer of the Cochin Government (formerly of the Great Northern Railway), has revived the question of railway extension to Cochin, and that the Dewan of Cochin is quite prepared to give all the support which lies in the power of his Government to any scheme in furtherance of this object. If Cochin Harbour is improved, the railway will be extended to the port, or if the railway is first extended, the improvement of the harbour will follow as a matter of course.

Appointment.—It will be seen, on reference to our advertising columns, that the directors of the Industrial Dwellings Company require the services of an architect and surveyor, at a salary of 600*l.* per annum. The duties of the appointment include the responsible supervision of the company's building operations. Mr. William Ward Lee, who has been honourably associated with the company since its formation in the year 1863, will be the consulting architect.

Mr. Sopwith, F.R.S.—Mr. Thomas Sopwith, M.A., F.R.S., who died at Westminster last week, was born in 1803, at Newcastle-on-Tyne. He was for nearly fifty years extensively engaged as a civil engineer in mining, railway, and other works, both in this country and on the Continent, and was the author of several works on architecture, isometrical drawing, and mining. In 1838 he was appointed Commissioner for the Crown under the Dean Forest Mining Act, and in the same year a communication made by him to the British Association led to the establishment of the Mining Record Office. He was one of the early members of the Institution of Civil Engineers.

Proposed Exhibition of Colonial Products.—At a meeting of the Royal Colonial Institute, held last week, the Council discussed a proposal made by Mr. H. B. Strangeways, late Premier of South Australia, for holding an exhibition in London of the products and manufactures of all the British Colonies. The matter was so far favourably entertained that it was decided to convene a special meeting of the Council to take it into further consideration. It is felt that if the proposed exhibition is held, it may play an important part in opening up new channels of trade for the benefit both of the mother country and her colonies.

An Accident has occurred at Birmingham, on the west suburban branch of the Midland Railway. The line, which runs by the canal side, is for some distance below the level of the houses which overlook it, and which are supported by a wall. Owing to the action of the frost, the foundations of this wall gave way, and a range of shopping fell forward on the line, cutting the telegraph wires and completely blocking the traffic. Happily the accident was discovered in time to warn a heavily-laden passenger train, which would otherwise have run into the wreck.

Two Lectures on "The Circle and the Straight Line" have been delivered by Mr. John Harris. The immediate purpose of the lectures was to show mathematically that the supposed demonstration upon which the presently accepted ratio of the circle's circumference to the diameter is based, is erroneous, pointing out the precise particular of the error and the manner in which the error in the first instance originated and has been subsequently overlooked by mathematicians.

Honorarium.—At a recent meeting of the Cheltenham Waterworks Company, whose works have just now been transferred to the Corporation, an honorarium of 600*l.* was presented to their engineer and manager, Mr. Wm. M'Landsborough, M. Inst. C.E., in appreciation of his successful services, and as an acknowledgment on the part of the proprietors of the professional ability and unremitting attention he has shown in the discharge of the duties of his office during the fourteen years in which he has been in the service of the company.

Midland Land and Investment Corporation.—At the annual meeting of the shareholders, to be held on Wednesday, the 29th inst., the directors will report that after deducting income-tax, interest on deposits, management charges, directors' remuneration, and making full provision for doubtful debts and contingencies, the balance of profit is 20,828*l.* 19s. 9d., and after setting apart the sum of 8,000*l.* to establish a surplus reserve, will declare a dividend at the rate of 15 per cent. per annum (free of income-tax).

Bromley Vestry-hall. — Bowey's Almshouses, Bow-road, E., were last week sold by auction for demolition, the site having been sold by the trustees with the sanction of the Charity Commissioners to the churchwardens and overseers of Bromley St. Leonard, upon which to erect a Vestry-hall. The designs for the new building have been prepared by Messrs. A. & C. Harston, and have been approved by the Local Government Board.

Southport.—In reply to their advertisement, the Highway Committee had seventy candidates for the situation of inspector of paving, &c. Ultimately Mr. Thomas Hewitt, paving inspector of Bolton, was appointed. He was selected from seven, who were sent for to give personal explanation.

Hardening Copper.—Dr. J. S. Mayer, of Virginia City, Nevada, claims that he has discovered the lost art, known to the ancient Egyptians, of tempering copper so as to produce an edge which will cut like steel.

Ubiquitous Paper. — A manufactory of paper bricks, according to *Capital and Labour*, has been opened somewhere in Wisconsin. The bricks are said to be exceedingly durable and moisture proof. They are also larger than the clay article. Paper is now also used for making barrels.

TENDERS

For supplying and fixing blinds at the Holborn Union Infirmary, Archway-road, Upper Holloway. Messrs. H. Saxon Snell & Son, architects:—

Haskins	£660 0 0
Williams & Son	654 2 0
Guynan & Son	640 0 0
Collyer & Son	590 2 0
Davey & Son	574 13 0
Janes & Co.	563 0 0
Janes & Son (withdrawn)	386 19 6

For rebuilding 147 and 149, Cannon-street, and 16 and 17, Nicholas-lane, for Mr. C. V. Game. Quantities by Messrs. Batterbury & Huxley:—

Moreland & Nixon	£11,150 0 0
Perry	9,862 0 0
Kiddle & Son	9,648 0 0
Browne & Robinson	9,472 0 0
Greenwood	9,236 0 0
Downs	9,171 0 0
Brass	8,793 0 0
Ashby Bros.	8,645 0 0
Prout	8,489 0 0

For alterations and repairs to a sugar bakehouse, 36, Denmark-street, Cannon-street-road, East. Messrs. Througood & Co., architects:—

Taylor & Parfitt (accepted)	£939 0 0

For a rectory at Roggiett, in the diocese of Llandaff, for the Rev. A. G. Morris. Quantities not supplied. Mr. E. A. Lansdowne, architect:—

Colman Bros.	£2,190 0 0
H. Richards	1,845 0 0
Linton	1,791 0 0
Mills	1,755 0 0
Morgan	1,750 0 0
Jones & Son	1,747 0 0
W. Richards	1,700 0 0
Blackburne	1,655 0 0
Sealey	1,648 0 0

For Wymondham Grammar School. Mr. Alfred Smith, architect. Quantities supplied:—

Stephens & Bastow	£3,179 0 0
Thurman	2,950 0 0
Hayes	2,944 0 0
Rowley & Lynex	2,900 0 0
Wood & Son	2,883 0 0
Foxon & Son	2,732 12 6
Halliday	2,730 0 0
Roberts Bros.	2,625 0 0
Barlow Bros.	2,600 0 0
S. & W. Pattinson	2,564 0 0
Kimberley	2,528 0 0
Barnes	2,489 0 0
Smith	2,480 0 0
Bailsford & Brown	2,445 0 0
Hall	2,420 0 0
Glover	2,384 0 0
Tutin	2,378 0 0
Bramage	2,300 0 0
Huddlesworth & Green	2,296 13 0
Cullock	2,155 0 0
Young (accepted)	1,998 0 0

For additions to Board schools, Medburn-street, St. Pancras. Mr. E. R. Robson, architect. Quantities by Messrs. Northcroft, Son, & Neighbour:—

Williams & Son	£6,670 0 0
Brass	6,666 0 0
Perry & Co.	6,626 0 0
L. H. & R. Roberts	6,496 0 0
Pritchard	6,289 0 0
Aitchison & Walker	6,166 0 0
Scrivener & Co.	6,161 0 0
Crockett	6,156 0 0
Lawrence	5,880 0 0
Hook & Oldrey	5,870 0 0
Grover	5,399 0 0
Wall Bros.	5,177 0 0

For alteration and addition to vicarage at Llantrissent, diocese of Llandaff, for Rev. W. A. White. Quantities not supplied. Mr. E. A. Lansdowne, architect:—

Williams	£577 0 0
Linton	570 0 0
Jones & Diamond	496 0 0
H. Richards	484 0 0
Jones & Son	467 10 0
G. Jones	455 0 0
Morgan	450 0 0
Orphan	449 0 0
Blackburne	435 0 0
W. Richards	420 0 0
Mills	410 0 0

For porter's lodge and waiting-room at Deptford Small Pox Hospital. Mr. Crickmay, architect:—

Reddin	£1,794 0 0
Castle	1,785 0 0
Frost & Co.	1,759 0 0
Shapley	1,690 0 0
Sawyer	1,650 0 0
Josline	1,650 0 0
Sims	1,609 0 0
Wall	1,597 0 0
Hobern	1,578 0 0
Hunt	1,554 0 0
Taylor & Parfitt (accepted)	1,550 0 0
Taylor & Son	1,549 0 0
Wise	1,525 0 0
Keith	1,429 0 0

For additions to Board schools, Middle-row, Kensal-road. Mr. E. R. Robson, architect. Quantities by Mr. W. H. Barber:—

Thompson	£3,480 0 0
Downs	3,357 0 0
Tongue	3,291 0 0
Hobson	3,257 0 0
Rankin	3,243 0 0
Williams, Son, & Wallington	3,240 0 0
Brass	3,195 0 0
Hook & Oldrey	3,150 0 0

TO CORRESPONDENTS.

H. M.—R. C.—H. C. T.—J. J.—W. McL—W. J. S.—Subscriber.—Plumber.—One of the Old School.—*Chemicus.*—C. S.—C. M.—H. G. H. P. L.—F. M—W. B.—H. & H.—A Firm of Engineers.—Ventilator.—G. M.—G. E. P.—W. H.—L. W. L.—H. S. H.—W. B.—C. B.—T. & P.—Inquiring Tradesman.

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